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(54) **Laser scoring of packaging substrates**

Einkerben von laminiertem Verpackungsmaterial mittels Laser

Entaillage avec laser des laminés pour emballage

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Description

FIELD OF THE INVENTION

This invention relates to packages, e.g., pouches; and, this invention relates to laser scoring of packaging substrates, e.g., providing two or three parallel laser scores so that the package has an easy-open feature.

BACKGROUND OF THE INVENTION

Films or sheets of polymeric barrier materials are formed into a finished package or "film package" such as a pouch by various techniques. For instance, by forming heat or adhesive seals about the periphery of the shape to be formed into a pouch. For example, if a square pouch is desired, a rectangular film twice the desired length of the pouch is folded, the two parallel sides of the periphery (perpindicular to the fold) heat or adhesive sealed, or, the two parallel sides and the fold are heat or adhesive sealed, the food or other material to be packaged inserted therein, and then the remaining open side of the periphery is heat or adhesive sealed. Another method for making a pouch is by sealing on three sides face-to-face films, filling the thus formed open pouch with food or whatever material is to be packaged therein, and then sealing the fourth side. For background on pouches or bags and their production, reference is made to U.S. Patent Nos. 4,190,477, 4,311,742, 4,360,550, 4,424,256 and 4,557,377, each of which being hereby incorporated herein by reference.

With respect to means for opening pouches or packages, or to laser scoring, or to laminate structures, reference is made to the following:

U.S. Patent Nos. 3,313,642, 3,404,988, 3,608,815, 3,626,143, 3,693,785, 3,790,744, 3,909,582, 3,925,591, 3,986,640, 4,172,915, 4,217,327, 4,236,652, 4,356,375, 4,407,873, 4,543,279, 4,549,063, 4,557,377, 4,571,340, 4,656,094, 4,698,246, 4,762,514, 4,765,999, 4,778,058, 4,784,885, 4,785,937, 4,788,105, 4,808,421, 4,834,245, 4,880,701, 4,894,115, 4,934,245; and, Japanese Utility Model Publications Nos. 54-22484 and 51-48775. Reference is also made to U.S. Patent No. 4,681,781, German Patent Document 2803074, UK 973,109 and EPA 0357841, of record in predecessor application Serial No. 07/550,738.

As is more fully disclosed hereinbelow, a brief summary of the technical problem addressed by this invention is how to provide a multilayer package which is formed from tough or strong polymer material, especially a package having side sealed edges, and yet which is easy to open, e.g. without need of a cutting instrument, both in terms of the initiation of the opening, including when it is desired, and in terms of control, e.g. directional control, of the opening across an entire width of the package.

The problem encountered by the end user of the food or material within the pouch is how to open the pouch. The pouches are usually formed from tough or strong polymeric barrier materials so the pouches do not open easily. One method for opening such pouches is to manually rip at the pouch which usually results in its contents spilling all about. Another method is simply cutting open the pouch with a scissor, knife or other sharp object. It is desirable to be able to neatly open a pouch without the need to use a cutting instrument. Furthermore, the problem of how to open a pouch is really two-fold: The first problem is how to initiate the opening. The second problem is providing control of the opening across the entire pouch.

To meet this desire of being able to open a pouch without a cutting instrument, some have proposed packages having an opening notch such V - or I - shaped notch or notches, or a tearing zone, see e.g., U.S. Patent Nos. 4,934,245, 3,404,988. U.S. Patent No. 3,693,785 relates to a wrapping material containing regenerated cellulose which has a portion thereof which is more frangible than the remainder thereof. Likewise, U.S. Patent No. 3,986,640 deals with a flexible package having a cut pattern, which when bent along the cut pattern, causes the package to open and the flowable contents therein to dispense. U.S. Patent No. 4,217,327 relates to forming a score line along a predetermined line in the surface of a plastic film to form a tear line. And, U.S. Patent No. 4,236,652 relates to a package having a cut score area to rupture open the package upon bending.

These previous proposals have not overcome the problem. Notches, cut patterns or tear lines can produce an opening which is easily propagated without any control. Further, notches, cut patterns or tear lines produce areas of weakness in the package, which, when stressed accidentally, e.g., during handling or shipping, can become an unintended opening which is easily propagated. That is, these proposals have not adequately resolved the problem of initiating an opening only when desired and of controlling the opening across the entire package.

Furthermore, these proposals have presented manufacturing problems. For instance, the problem of properly locating the notch, cut pattern or tear line in a position where the consumer desires to open the package. If not properly positioned, the resulting package can be worse than if no such notch, cut pattern or tear line had been provided: The consumer must still resort to a sharp object to open the package, but it is weakened at some point (due to the mispositioned notch, cut pattern, or tear line). In addition, opening features such as those on cigarette packs require a separate opening tape which means that it is more costly to manufacture the package because it requires a separate material (the tape) and a complicated process.

Roughening an area of the package is another type of proposal to open a package without the need for a cutting instrument. U.S. Patent No. 3,313,642 relates to

a process of modifying the surface properties and polyolefin film.

U.S. Patent No. 4,778,058 provides a pouch from a film of two plastic layers. A discreet area of the first layer, corresponding to a folded portion of the resultant pouch, is surface roughened prior to lamination to the second layer. The irregularities from roughening are filled with the plastic material of the second plastic layer. The film of the two layered film is heat-sealed into a pouch. The surface roughening is at a position on the first layer of the film other than the portion thereof to be heat sealed. While U.S. Patent No. 4,778,058 may provide for tear initiation, it still fails to provide for control of the tear as is desired by the end user.

U.S. Patent No. 4,543,279 relates to a film product, such as a sealed bag, wound film or adhesive tape, having a plurality of random scratches or cuts formed along the edges and oriented toward the other side of the film. In a bag of U.S. Patent No. 4,543,279, the scratches are formed on the longitudinal edge portion of the bag, outside of the seals thereof, or on the longitudinal edge portion outside of the seal and a central line inside the seal. While placing scratches on a central line inside the seal may provide for tear initiation, the placement of the scratches outside of the seals may not adequately provide for tear initiation as the user must still rip through the seals. And, no provision is made for tear control.

U.S. Patent No. 3,608,815 relates to an opening aid for packages made from at least one oriented material. The opening aid consists of minutely expanding the oriented material at a plurality of points within an area pattern which will be a fold of the package. U.S. Patent No. 3,608,815 simply provides tear initiation like the previously discussed notch or cut techniques. However, U.S. Patent No. 3,608,815 chalks up tear control to the nature of the materials of the package, stating that oriented materials "tear in an essentially straight line" while cellophane will tear without directional control. Thus, U.S. Patent No. 3,608,815 does not adequately provide tear control.

Japanese Utility Model Publication No. 54-22484, published August 6, 1979 (Application No. 50,68727 dated May 23, 1975; Early Disclosure No. 51-150915, dated December 2, 1976), relates to a bag having seals with tear-initiating lines. The tear initiating lines consist of ordered, successively smaller pinholes or notches extending from the outer edge of the seal and terminating at the center of the seal so that the inner half of the seal is the same as an ordinary seal. It is stated in this publication that the holes or notches ar not to extend all the way into the enclosed part of the bag, i.e., across the entire width of the seal, because to do so will impair the strength and the airtightness of the seal. Further, this publication poses manufacturing problems which it leaves unaddressed. To effect the tear-initiating line, the films of the bag must be selectively cut or notched: The cuts or notches are organized along lines and are of varying size and extend only through one-half of the seal. Thus, this publication calls for a very complicated manufacturing process.

Japanese Patent Publication No. 51,48775, published December 22, 1976 (Application No. 49-49804 dated May 7, 1974; Early Disclosure No. 51-16346, dated February 9, 1976), deals with placing minute scars, embossment or scratches along the center line of a laminate plastic film which is then slit lengthwise along the center line to make two adhesive tapes. The problems of tear initiation and tear control in the opening of packages are not addressed in this publication.

Bowen, U.S. Patents Nos. 3,909,502 and 3,790,744, Fry, U.S. Patent No. 3,626,143, Ang, U.S. Patent No. 4,549,063, Josephy, U.S. Patent No. 4,356,375 and Yoshida, U.S. Patent No. 4,762,514 all relate to laser scoring and each of these U.S. Patents is hereby incorporated herein by reference.

Bowen, U.S. Patent No. 3,790,744 relates to forming one line of weakness in at least one but not all layers of a multilayer structure by preferentially vaporizing with a beam of radiant energy a line in at least one layer which is not the most proximate layer in relation to the source of radiant energy. Bowen, U.S. Patent No. 3,909,582, deals with forming a line of weakness defining a tear path in a multilayer laminate by scoring with a beam of radiant energy the most proximate layer in relation to the source of radiant energy. While these patents may speak of forming one or more lines of weakness or at least one line of weakness, neither of these patents indeed teaches or suggests forming a plurality, e.g., two or three, parallel, laser scores to provide the easy-open feature of the present invention. Further, neither of these Bowen patents teaches or suggests the multilayer laminates of the present invention, or the manufacturing advantages of the present invention.

Fry, U.S. Patent No. 3,626,143, similarly relates to focusing a single beam of laser light upon a thermoplastic substrate so as to form a single score. Fry fails to teach or suggest forming a plurality of parallel scores, or the laminates or advantages of the present invention.

Ang, U.S. Patent No. 4,549,063 deals with forming a crack and peel feature on the backing of an adhesive laminate by providing the backing with one or more non-linear, discontinuous, preferably sine-wave geometric pattern, lines, preferably by a laser. Ang fails to teach or suggest forming a plurality of parallel, linear or substantially straight, and preferably continuous scores as herein to provide an easy-open feature to a package; and, Ang fails to teach or suggest the laminates and advantages of the present invention. Josephy, U.S. Patent No. 4,356,375, also relates to forming a line of weakness in the protective backing of an adhesive laminate, and suffers from the same deficiencies of Ang, Fry and Bowen.

European Patent Application Publication No. 0 357 841 A1 discloses a method of providing score lines of various configurations in packaging material using a laser beam moved in two mutually perpendicular direc-

tions. The reference discloses a package formed of polypropylene, lacquer and paper layers and having a score line or two widely spaced score lines extending down to the paper and across the width of the package and around its side walls. The reference also discloses another package formed of a single layer of polypropylene, having side sealed edges and having a score line which is cut partly into the propylene and extends from the top of the package around its bottom and back up to its top. There is no disclosure of tearing through a tear strip area to open a package. There is no disclosure of a package having side sealed edges and scores extending across a full width of the package, including across the side sealed edges. There is also no disclosure of the multiple layer structures of the package of this invention.

European Patent Application Publication Number 0 299 520 A2 discloses packaging materials for packaging photographic photosensitive materials to protect the photosensitive materials from light. The packaging materials comprise a pair of inflation film layers disposed symmetrically and joined through a pseudo-adhesive portion formed by blocking thereof. This reference discloses a packaging film structure formed of polyester, light reflective aluminum, adhesive (LDPE), LLDPE/HDPE blend, LLDPE, LLDPE, and LLDPE/HDPE blend layers. None of the packaging materials are described as having side sealed edges or being scored.

European Patent Application Publication 0 164 232 discloses a multilayer sheet structure suitable for forming tubular squeeze containers, e.g. for dentifrice products. The sheet structure incorporates an interior (not a surface) layer of oriented polymer material e.g. polypropylene or polyester, to provide the sheet structure with improved stability for printing, and with improved strength, deadfold and processing characteristics. The sheet structure is formed of layers of (outside to inside): heat sealable adhesive, foil, adhesive, two layers of polyethylene or ethylene copolymer, primer, oriented polymer (e.g. polypropylene, or polyester), adhesive (optional) and heat sealable material. The packages of this reference do not have side sealed edges and are not scored.

Yoshida, U.S. Patent No. 4,762,514 deals with laser scoring a beverage pouch in a particular pattern to facilitate rupture to introduce straw, e.g., scores in an "X" shape, on a "Y" or a star shape or a series of parallel cuts. However, this patent fails to teach or suggest a package such a pouch having a plurality of parallel, linear or substantially straight scores which extend across the entire width of the package, near or adjacent to a seal thereof, to provide an easy-open tear feature on said package as provided for herein; and, Yoshida fails to teach or suggest the laminates and advantages of the present invention.

Eichelberger, U.S. Patent No. 4,894,115, incorporated herein by reference, is concerned with the fabrication of integrated chip assemblies having a dielectric polymer layer thereover which is laser-scored to access the chip for electrical connections. This patent is disclosed and incorporated herein because it deals with a use of a laser, but, it is not considered pertinent and is considered non-analogous to the present invention.

The remaining patents disclosed herein deal with diverse multilayer packaging laminates, and, either individually or in any combination fail to teach or suggest the laminates or advantages of the present invention. Certain of these patents, e.g., U.S. Patent Nos. 4,407,873, 4,785,937, 4,808,421 or 4,571,340 may mention retortable, microwaveable or ovenable containers, but do not disclose or suggest the mix and bake pouch of the present invention.

As is more fully disclosed herein below, the solution to the above problems is to provide a package of the invention having at least two parallel, linear laser scores closely spaced to each other, e.g. from 1.587 to 4.76 mm (1/16" to 3/16"), aligned on the front and rear faces of the package, and which extend across an entire width of the package, including across the side sealed edges, preferably adjacent or near a seal of the package, wherein the scores can extend through the first and second layers but not through the third layer of the package. The solution provides an easy open tear control feature such that an end user tearing at the tear strip area to tear away a portion of the package and open the package, obtains a controlled tear opening through the tear strip area across the entire width of the package, such that the tear strip area is divided between the package and the torn away portion of the package.

The solution is also to provide the package of the invention with certain layers which can comprise the layer combinations disclosed below.

Thus, heretofore, a package, preferably a pouch, having an easy-open tear feature comprising a plurality of linear, or substantially straight, e.g., two or three preferably continuous laser scores extending across the entire width of said pouch and preferably disposed near or adjacent to a seal thereof, has not been disclosed or suggested. Nor has such a scored pouch from a multilayer structure, e.g., a laminate, comprising from outer layer to inner layer, Polyester/Polyethylene/Polyester/Polyethylene, e.g. white block polyethylene/coextrusion sealant film, e.g., at least one layer high density polyethylene, e.g., white colored/linear low density polyethylene wherein the scores can extend through the first two layers of polyester and polyethylene, but not through the third, or internal, polyester layer, been disclosed or suggested.

Nor has a structure comprising (outer) polyester/polyethylene/high density polyethylene/linear low density polyethylene (inner) been disclosed or suggested. Nor has such a structure in the form of a pouch having a plurality of linear, or substantially straight, preferably continuous laser scores extending across the entire width of said pouch and disposed near or adja-

cent to a seal thereof, been disclosed or suggested.

Further, a large pouch, having an easy-open tear feature of a plurality of parallel, linear or substantially straight, preferably continuous scores extending across the entire width of said pouch, wherein one can mix ingredients, e.g., cake mix, such as with a mixer; and, once mixed, rip away the top portion of the pouch using the score lines and then employ the remainder of the pouch as a pan to bake in, has not been disclosed or suggested.

It is therefore an object of this invention to provide the pouches and multilayer structures or laminates which have heretofore not been disclosed or suggested. It is also an object of this invention to provide manufacturing advantages from the application of a plurality of parallel, linear or substantially straight scores across the entire width of a pouch.

SUMMARY OF THE INVENTION

It has been surprisingly discovered that package machinery alignment, and a package having tear initiation and tear control, result from laser scoring of the package substrate, particularly, by providing at least two substantially, parallel, substantially straight or linear, laser scores across the entire width of such a package substrate.

Thus, the present invention provides an easy-open, tear control package, e.g., a pouch, comprising multilayer or film structure sealed together, e.g. such that the package has a front face and a rear face wherein on the outer surface of the said film structure, e.g., wherein at an isolated area which is to be at least a full width of said package and/or structure and preferably adjacent to or near at least one seal, the said package is laser scored with at least two substantially parallel, substantially straight or linear, laser scores, e.g., laser scoring on front and/or rear faces. If the package has front and rear faces, then between the faces, at one end of the package, preferably at the end opposite the plurality of laser scores (if only one set of laser scores be provided) can be an additional multilayer film structure, adhered to the inner surface of each face so that the package can have an expandable bottom, e.g., open and have volume to it.

The film structure can comprise, from outer layer to inner layer; a first layer comprising polyester, a second layer comprising polyethylene, a third layer comprising high density polyethylene, and a fourth layer comprising linear low density polyethylene. Alternatively, the film structure can comprise, from outer layer to inner layer, a first layer comprising polyester, a second layer comprising polyethylene, e.g., white polyethylene, a third layer comprising polyester, a fourth layer comprising polyethylene, e.g., white polyethylene and/or a block polymer or copolymer of polyethylene, a fifth layer comprising a coextrusion which can be a sealant film comprising at least one high density polyethylene, e.g., orange colored high density polyethylene, and, a sixth layer comprising linear low density polyethylene, e.g., a clear linear low density polyethylene, and, in this alternative embodiment, the laser scores preferably cut through the first or through the first and second layers, but not through the third layer (i.e., not through the internal layer comprising polyester).

The film structures of this invention can also comprise:

(i) PET/INK/LDPE/PET/LDPE/Coextrusion of HDPE, HDPE, LLDPE; or
PET/LDPE/PET/LDPE/Coextrusion of HDPE, HDPE, LLDPE;
(ii) PET/Coextrusion of LDPE, EAA/Foil/EMA; or
PET/INK/Coextrusion of LDPE,EAA/Foil/Primer/EMA;
(iii) Polypropylene (e.g., OPP)/INK/Coextrusion of LDPE, LDPE/Coextrusion of HDPE, HDPE, LLDPE; or
Polypropylene (e.g., OPP)/Coextrusion of LDPE, LDPE/Coextrusion of HDPE, HDPE, LLDPE;
(iv) Polypropylene (e.g., OPP)/INK/LDPE/Coextrusion of HDPE, HDPE, LLDPE; or
Polypropylene(e.g., OPP)/LDPE/Coextrusion of HDPE, HDPE, LLDPE;
(v) HDPE/HDPE/LLDPE, e.g., by Coextrusion.

And, in these embodiments the laser scores extend down into the structure an appropriate depth. For instance in (i) the laser scores preferably extend to but not through the first LDPE layer (The third layer of the alternative with ink, the second layer of the alternative without ink). In (ii) the laser scores preferably extend to but not through the first PET layer. In (iii) the laser scores preferably extend to but not through the Polypropylene layer. In (iv) the laser scores can extend to but not through either the polypropylene layer or the first LDPE layer (third or second layer of structure). In (v), the laser scores can extend to but not through either the first or second HDPE layer. In this instance, the term extend to but not through means that the laser scores can cut into the layer somewhat but not all the way through, e.g., in (i) the scores may extend up to three quarters through the first LDPE layer, and, likewise for embodiments (ii) - (v).

The present invention also provides methods for making easy open packages, preferably pouches, comprising forming multilayer or film structure for a package and laser scoring the same. If the package has front and rear faces, then the method includes sealing together those faces so that the package has a front face and a rear face, and then laser scoring an outer surface of said film structure. The laser scoring in the method of this invention is at an isolated area which is: a full width of the package, preferably adjacent to or near at least one seal, and if the package has front and rear faces, on the front face and/or rear face when said film structure

is sealed together to form the said package; said laser scoring being such to provide at least two substantially parallel, substantially straight or linear laser scores. The multilayer film structure for the front and rear faces are preferably joined, i.e., aligned face-to-face and sealed on three sides prior to scoring; these faces, in the mass production of such packages, are aligned and sealed as a plurality of packages in roll form. The rolls are then passed under the laser or lasers for the scoring.

The packages of this invention can be used for any purpose, e.g., pouches or containing beverages such as citrus juices, e.g, orange juice, or concentrates thereof; or, as packaging for soap. The packages of this invention can also take the form of a large pouch with a mix contained therein, e.g., a cake mix; the pouch has a plurality of laser scores at each end of it. The user can open one end of the pouch by tearing at the laser scores at a first end. Ingredients can then be added into the open pouch, e.g., eggs, milk, water, butter, oil or the like; and, the ingredients can even be admixed in the pouch. After adding and mixing, if necessary, the end user can rip at the second set of scores and the remainder of the package can then be used as a cooking pan to bake the ingredients (e.g., into a cake).

BRIEF DESCRIPTION OF DRAWINGS

Figs. 1-3 show apparatus of and for making the present invention.

Figs. 4-4B show packages of the present invention.

Figs. 5A-5F show a package of the present invention, sealed, opened, having ingredients added and mixed therein, and, in the final state as a pan.

Fig. 6 shows a package of the present invention.

Fig. 7 shows a sheet for a package of Fig. 6.

DETAILED DESCRIPTION

It has now been surprisingly found that an easy-open tear control package, e.g., a pouch, is easily manufactured by (i) forming, preferably by extruding face-to-face films, or film structure or multilayer structure, preferably comprising polymeric and/or thermoplastic material; (ii) sealing three sides of the face-to-face films with the outer surfaces facing out to form an open package; (iii) laser scoring the outer surface, front and/or rear of said open package at an isolated area which is to be at least a full width of said package, and preferably adjacent to or near a seal, and also preferably on both said front and rear faces, so as to provide at least two substantially parallel, substantially straight or linear laser scores; (iv) filling the thus formed scored open pouch; and (v) sealing the remaining side to form a closed pouch.

Between the faces, at one end of the package, preferably at the end opposite the plurality of laser scores, if only one set of laser scores is provided, and also preferably opposite the side sealed in step (v), and additional multilayer or film structure can be provided, adhered to the inner surface of each face so that the package can have an expandable side or bottom (See Fig. 4A). This additional film structure can fold between the faces when the open pouch is not filled. Alternatively, this additional multilayer or film structure can be lap sealed to the faces such that the bottom of the pouch is rounded. Thus, between steps (i) and (ii) can be the additional step of forming an additional multilayer or film structure; and, step (ii) can additionally comprise sealing said additional multilayer or film structure to the inner surfaces of each face at or near an end of said package so that the package can open and have volume to it. Steps (i) to (ii) can also and preferably include even providing printing on the pouch, prior to the laser treatment.

The product of steps (i) to (ii) can be manufactured in roll form so that step (iii) can be automated, e.g., as shown in Figs. 1-3.

The present invention also provides a method of making an easy tear open package comprising a multilayer or film structure from which said package is made by folding and sealing said film structure; and laser scoring said film structure with at least two substantially parallel, substantially straight or linear laser scores so as to provide the package with a tear strip; the laser scoring is performed preferably prior to said film structure being folded and sealed into the form of a package.

The laser scores in this invention can be spaced 1.587 mm (1/16"), 3.175 mm (1/8"), or 4.76 mm (3/16") apart naturally, the distance may be varied to suit the various purposes of the pouch. The application of the plurality of laser scores in an automated process achieves machinery alignment and provides the resultant package with an easy tear-open feature. In particular, an effective easy tear open feature was not provided when a single laser score was provided to a packaging substrate because, for instance, if the scoring was on the front and rear faces of the package, the side-to-side weave on machines for manufacturing such packages meant that the single scores on the front and rear faces did not align; so, no easy tear open feature. However, it was also found that the weave can offset single scores by approximately 1.587 mm (1/16") to 3.175 mm (1/8"); thus, the plurality of scores provided for herein provides an easy tear open feature because alignment of scores accordingly results. Bartelt, HMC or other high speed machines are useful for forming packages of this invention. Further, applying a packaging substrate can provide a tear strip feature therefor (See Fig. 6 and 7).

A presently preferred multilayer or film structure for a package of the present invention can comprise, from outer layer to inner layer: a first layer comprising polyester, a second layer comprising polyethylene, a third layer comprising high density polyethylene, and a fourth layer of linear low density polyethylene. Alternatively, the multilayer or film structure can comprise, from outer layer to inner layer, a first layer comprising polyester, a second

layer comprising polyethylene e.g., white polyethylene, a third layer comprising polyester, a fourth layer comprising polyethylene, e.g., white polyethylene and/or a block polymer or copolymer of polyethylene, a fifth layer comprising a coextrusion which can be a sealant film comprising high density polyethylene, e.g., orange colored high density polyethylene, and, a sixth layer of linear low density polyethylene, e.g., a clear linear low density polyethylene; and, in this alternative embodiment, the laser scores would cut through the first or through the first and second layers, but not through the third layer (i.e., not through the internal layer comprising polyester). Polyester layers can be not only copolymer of polyester (or CoPET) or from polybutylene terepathalate or copolymers thereof (or CoPBT).

Other preferred structure for the present invention include:

(i) PET/INK/LDPE/PET/LDPE/Coextrusion of HDPE, HDPE, LLDPE; or
PET/LDPE/PET/LDPE/Coextrusion of HDPE, HDPE, LLDPE;
(ii) PET/Coextrusion of LDPE, EAA/Foil/EMA; or
PET/INK/Coextrusion of LDPE,EAA/Foil/Primer/EMA;
(iii) Polypropylene (e.g., OPP)/INK/Coextrusion of LDPE, LDPE/Coextrusion of HDPE, HDPE, LLDPE; or
Polypropylene (e.g., OPP)/Coextrusion of LDPE, LDPE/Coextrusion of HDPE, HDPE, LLDPE;
(iv) Polypropylene (e.g., OPP)/INK/LDPE/Coextrusion of HDPE, HDPE, LLDPE; or
Polypropylene(e.g., OPP)/LDPE/Coextrusion of HDPE, HDPE, LLDPE;
(v) HDPE/HDPE/LLDPE, e.g., by Coextrusion.

And, in these embodiments the laser scores extend down into the structure an appropriate depth. For instance in (i) the laser scores preferably extend to but not through the first LDPE layer (The third layer of the alternative with Ink, the second layer of the alternative without Ink). In (ii) the laser scores preferably extend to but not through the first PET layer. In (iii) the laser scores preferably extend to but not through the Polypropylene layer. In (iv) the laser scores can extend to but not through either the polypropylene layer or the first LDPE layer (third or second layer of structure). In (v), the laser scores can extend to but not through either the first or second HDPE layer. In this instance, the term extend to but not through means that the laser scores can cut into the layer somewhat but not all the way through, e.g., in (i) the scores may extend up to three quarters through the first LDPE layer, and, likewise for embodiments (ii) - (v).

In (i) the first layer can be 48ga. LBT PET, the first LDPE layer can be 14#/ream white LDPE, the second PET layer can be 48gm LBT PET, the second LDPE layer can be 14#/ream Black/White LDPE, and, the Coextrusion can be a 2 mil coextrusion of white HDPE/orange HDPE and LLDPE. In (ii) the PET layer can be 48ga. LBT PET, the coextrusion can be a first layer of 5#/ream white LDPE and a second layer of 2#/ream EAA, the foil can be 0.00635 mm to 0.00762 mm (.00025 to .00030 inches) thick, and, the EMA can be 10#/ream. In (iii) the polypropylene is preferably oriented polypropylene (OPP) and can be 50 or 70ga.; the coextrusion of LDPE, LDPE can be 7 to 10#/ream LDPE, e.g.; white/black LDPE; and the coextrusion of HDPE HDPE, LLDPE can be a 0.04445 - 0.05715 mm (1.75 - 2.25 mil) blown coextrusion of white HDPE/white/black HDPE/orange LLDPE. In (iv) the polypropylene is preferably OPP, e.g., 50-75ga., the LDPE can be 10#/ream, e.g., white/black LDPE; and, the coextrusion of HDPE, HDPE, LLDPE can be a 0.04445 - 0.05715 mm (1.75-2.25 mil) blow coextrusion as in (iii). And, (v) can be a 0.1016 mm (4 mil) blown coextrusion of while HDPE/white/black HDPE/orange LLDPE. In this discussion it should be understood that PET means polyethylene terephthalate, LDPE means low density polyethylene, HDPE means high density polyethylene, LLDPE means linear low density polyethylene, EAA means ethylene acrylic acid, and EMA means ethylene methyl acrylate.

The present invention also provides an easy-open, tear control package. The packages can comprise multilayer or film structure which is folded and sealed together wherein, prior to said structure being folded and sealed to form said package, said film structure is laser scored with at least two substantially parallel, substantially straight or linear laser scores so that said package has a tear strip.

Alternatively, the package of the present invention can comprise a pouch, comprising multilayer or film structure sealed together such that the package has a front face and a rear face wherein on the outer surface of the said film structure, front and/or rear face of the resultant package at an isolated area which is to be at least a full width of said package and preferably adjacent to or near a seal, the said package is laser scored with at least two substantially parallel, substantially straight or linear laser scores. It is noted that an additional multilayer or film structure can be adhered to the inner surface of each face at or near an end of said package so that the package has an expandable side or bottom (Fir. 4A). This additional structure can fold between the faces when the open pouch is not filled; or, this structure can be lap sealed to the faces so that the bottom of the pouch is rounded.

Pouches of this invention can be used for food, medical supplies, blood or for any conventional uses of pouches. They can be used as retort pouches. They can also be employed in modified atmosphere packaging wherein the product to be contained within the pouch and/or the pouch are prepared under a sterile and/or inert atmosphere, and the product is packaged within the pouch under the same or similar conditions.

For instance, pouches of this invention can be used as packaging for beverages such as juices or for concentrates. When pouches of this invention are used for juice concentrates, it is preferred that the pouch have a third film so that the pouch can expand and hold a volume of fluid because after the end user has opened the package and emptied the contents therefrom, he can then use the pouch to measure and hold water for reconstituting the juice. And, as stated earlier, pouches of this invention can contain ingredients, be opened, have further ingredients added thereto and mixed therein, and then be further opened and used as a pan to bake in.

Likewise, in general, packages of this invention can be used for packaging anything, e.g., the embodiment of the present invention comprising a structure folded and sealed to make a package can be used to package soap. Note that any contents of a package or of a pouch of this invention is not to be a limitation of the invention. Further, it is noted that it a package of this invention is to be used for food, drugs, cosmetics, or the like, the constituents thereof, including any inks used in printing information on the package (e.g., as a layer of the film structure) should meet governmental regulations, e.g., FDA regulations.

Furthermore, a package, e.g., a pouch, of this invention can be made by forming, preferably extruding, a tube, e.g., of polymeric material and/or thermoplastic; laser scoring a circumferential area of the outer surface of said tube at at least one end thereof, said area corresponding to the width of the package to be formed and being on the front and/or rear faces of the resultant pouch; sealing one end of said tube to make an open pouch; filling said open pouch; and, sealing the open end. The laser scoring provides at least two substantially parallel, substantially straight or linear scores.

In all embodiments herein, the scores are preferably continuous, but need not be. The scores can be discontinuous, e.g., scores along a line can be two cuts or a series of cuts.

As to extrusion or coextrusion methods an apparatus for making multiple layer sheet materials, reference is made to commonly owned U.S. Patent application Serial Nos. 07/458,486, 07/458,487, and 07/458,488, all filed on December 28, 1989, and each incorporated herein by reference. And, as to blended film structures, reference is made to commonly owned U.S. Patent application No. 07/458,489, filed December 28, 1989 and incorporated herein by reference. For further background on films and apparatus for producing them, reference is made to U.S. Patent Nos. 3,477,099, 4,755,402, 3,558,330, 4,714,638, 4,842,791, 4,379,117, and 4,804,510 each of which being incorporated herein by reference.

While the preceding text and elsewhere herein speaks of "extruding", it should be understood that this invention is applicable to any process for forming films, film structures or laminates (which can then be formed into a package, preferably a pouch or a structure to be folded and sealed), including laminations, extrusions, coextrusion, blown extrusion, tubular water quench extrusion, extrusion coating, and the like, and combinations thereof. Likewise, the present invention is applicable to any process and apparatus for forming a package or for forming a pouch (so long as at least a width thereof, preferably adjacent to a seal thereof is laser scored on the outer surface with at least two scores so as to provide an easy open tear feature), including, a horizontal pouch forming machine and a vertical form, fill and seal machine.

Furthermore, in addition to the above-disclosed preferred multilayer or films structures, other films (of either single or multilayers), structures or laminates preferably comprising polymeric and/or thermoplastic materials can be formed into an easy-open tear control package (including pouch) in accordance with this invention. Suitable materials for such other films, structures or laminates or layers thereof can be almost any materials conventionally used in the art, e.g., metal foil, vinylidene chloride copolymers, polyethylene (PE), medium density polyethylene (MDPE), high density polyethylene (HDPE), low density polyethylene (LDPE, linear low density polyethylene (LLDPE), very low density polyethylene (VLDPE), polypropylene (PP), ultra linear low density polyethylene (ULDPE), propylene ethylene copolymer (PPE), MXD6, nylon, high impact polystyrene (HIPS), ethylene vinyl alcohol (EVOH), ethylene butene copolymers (EB), polyethylene terephthalate (PET), polybutylene terephthalate (PBT), copolymers of PET or of PBT or CoPET or CoPBT, ethylene vinyl acetate (EVA) (in which case preferably a high VA content EVA, i.e., about 28-35% by weight VA EVA), (E.g., Exxon LD-761 or, inks, primers or ionomer resins, e.g., Surlyn (Du Pont), or the like, or mixtures thereof. In multilayer films or laminates, for some applications, it may be preferred that at least one layer, such as an internal layer, comprise a barrier material.

In multilayer films, structures or laminates, a tie or an adhesive may also be present between the layers. suitable materials for such tie layers or adhesives are known to the ordinary skilled artisan and may include, be way of example, anhydride modified polyolefins, (e.g., graft copolymer of maleic anhydride and propylene wherein maleic anhydride moities are grafted onto polypropylene chains) ethylene acrylic acid copolymers, ethylene methyl acrylate copolymers, blends or copolymers of PP and EVA, or other synthetic resinous materials. The selected adhesive should be stable under the conditions by which the packages of the invention are prepared or used. For additional information on adhesives, reference is made to commonly owned U.S. Patent Application Serial No. 07/458,489, filed December 28, 1989. Commercially available products for layers in products of the invention include nylon 6; 11; 12; 6, 12; and 6, 66; ULTRAMIDKR 4600 (BASF), NOVAMID 2030 (Mitsubishi Chem. Co.), DURATHANE (Farbenfabriken

Bayer A.G.), "1030" (Unitika, Japan) SYTEL SUPERTUFF 811 (Du Pont), "4018" (Huels, Germany), and ELY 1256 (Elmser, Switzerland), Mylar, Dalar, Exxon 5610A-2 (blend of PP containing EVA), Admer (Mitsui, No. AT469C), Bynel (Du Pont E361 or 3036), Plezar 3342, and Surlyn. Admer, Bynel and Plexar are believed to be Maleic anhydride modified polyolefins.

Films or layer in this invention, may be oriented, if desired, e.g., for a particular end use, by conventional processes, such as blown tubular orientation, stretch orientation, or molecular orientation. They may also be cross-linked by conventional processes such as by irradiation, heat, or the addition or cross-linking agents.

Vinylidene chloride copolymers as mentioned herein include vinylidene chloride vinyl chloride copolymers (VC, HB Sarans, Dow Chemical Co.), and vinylidene chloride methyl acrylate copolymers ("MA-PCDC copolymers") (MA Saran, Dow 119, Dow Chemical Co. and MA-PVDC copolymers containing essentially no EVA, See U.S. application Serial No. 07/458,848, filed December 28, 1989 and incorporated herein by reference). As to polyvinylidene chloride films and methods of making and using them, attention is further directed to commonly owned U.S. Patent applications Serial Nos. 07/458,485, 07/458,489, and 07/458,490, all filed on December 28, 1989, and each incorporated herein by reference. In MA-PVDC copolymers, the methyl acrylate is preferably present in an amount of about 3 to 8% by weight, more preferably from 6 to 8% by weight, based upon total weight. However, the methyl acrylate content can be up to 12% and even up to 15% in some instances. vinylidene chloride copolymers, EVOH and metal, (e.g., aluminium foil), are useful as barrier layers in multilayer film structures. These materials can be employed as an additional internal layer in the preferred structures disclosed herein, e.g., between the second and third or between the third and fourth layers of the first film structure herein, or anywhere beneath the second layer in the alternative film structure disclosed herein.

However, rather than using ink or an ink layer for printing on packages or pouches of this invention, any appropriate printing process can be employed., e.g., a rewinder which imprints appropriate characters into the film comprising polymeric and/or thermoplastic material. Packages and pouches of this invention can be heat or adhesive sealed. It has been found that the laser scoring herein across the entire width of a package, including across side seal thereof, when present, does not weaken or reduce the air-tightness of the so scored side seals.

Throughout this specification, reference has been or will be made to multilayer structures, films, film structures or laminates. These multilayer or film structures, films or laminates are the same thickness as conventional multilayer structures, films, film structures or laminates. Typical thicknesses of films and film structures can range from about 0.051 mm (2.0 mils) to 0.127 mm (5 mils) or more, with a normal range of about 0.0127 mm to about 0.127 mm (0.5 to about 5.0 mils), preferably about 0.038 - 0.076 mm (1.5 to about 3.0 mils). Films thinner than about 0.038 mm (1.5 mils) may be too weak to perform their required function (although individual layers of multilayer structures may be thinner than about 0.038 mm, e.g., about 0.00635 mm to about 0.0254 mm (1.5 mils, e.g., about 0.25 to about 1 mil)). Laminates can be up to 0.254 mm (10 mils) thick and multilayer structures can include films, (even single layer films) film structures and laminates and can be up to 2.54 mm (100 mils) thick. "Structure" includes multilayer structure as used herein. A container from a multilayer structure can have an average thickness of about 0.765 mm (30 mils).

As is well known, a laser is a device which emits a powerful, concentrated beam of light. The beam is stimulated, amplified, electromagnetic radiation and is made up of light waves all of which are, for all practical purposes, coherent, i.e., in phase, and monochromatic, i.e., of the same wavelength. Each laser is usually named according to the particular lasing medium which it employs, and, depending on the particular atomic structure of that medium. each laser emits its own specific and characteristic wavelength, i.e., one of a well defined frequency. Laser wavelengths can range from about 0.2 to about 40 microns and their frequencies from about 1.5×10^{15} to about 0.75×10^{13} cycles per second.

Laser light waves transport great energy. The power available from such energy can range from a fraction of a watt to many thousand watts. The intensity of the energy, i.e., the amount that flows per second across a unit area of material perpendicular to the beam, can be varied and controlled by, for example, varying the focus of the beam according to various known methods.

The energy of a laser beam is transported according to the output pattern or mode structure of the beam. A beam can have a single or multimode structure. A beam of single mode output, has all its energy in a single hot spot with an intensity distribution that follows a gaussian curve when the intensity points are taken along a line perpendicular to the axis of the beam. A multimode beam is comprised of a series of rings and/or spots symmetrical about the beam axis. The single mode beam can be focused to a smaller spot diameter than the multimode beam. Such a spot has very high intensity and is therefore the most valuable for cutting and scoring.

Laser radiation is of two types, pulsed and continuous. The former involves short, relatively high powered pulses or emissions which can span, for peak pulses, from about 15 nanoseconds to about 1 millisecond, and for standard control pulses, from about 1 millisecond to greater than one second. Continuous or steady-rate emissions are preferred for industrial use because they transport a substantially greater amount of total energy.

Examples of several types of lasers available for

industrial use are: gaseous lasers such as carbon dioxide or helium-neon; solid state light pumped lasers such as ruby, neo-dynium-yttrium aluminium garnet (Nd-YAG), or glass; semi-conductor lasers such as gallium arsenide, and plastic lasers and lasers using conjugated organic molecules such as benzene, toluene or napthalene.

Although the source of radiant energy can be any source capable of providing radiant energy of sufficient intensity to form the aforementioned plurality of scores in a multilayer structure according to the method of this invention, the preferred source is a laser. Although many lasers are capable of emitting a beam of radiant energy of such an intensity, it has been found that for commercially forming preferential, easy opening tear scores in multilayer laminate packaging materials, a laser whose beam is focusable to a small spot size or diameter is most suitable. A small spot size is desirable because energy therein contained is so concentrated that a small, precise volume of laminate material can be rapidly heated, vaporized or other-wise degraded in manner that effects a clean cut or score line without affecting adjacent areas of the material.

The wavelength of the laser beam can be any wavelength whose relationship to the absorptive characteristics of the materials of the multilayer structure is such that it will be selectively absorbed in at least one pre-selected layer in a manner that will effect suitable scores in that layer and in the composite laminate. The frequency of the radiation and other laser and beam characteristics such as the output power of the laser and mode structure and spot size of the beam, can be any combination which will provide a beam of radiant energy of the aforementioned sufficient intensity to effect the aforementioned plurality of scores. For the purpose of this invention, a score is any alteration in the structure along a predetermined path in only or more layers of the multilayer structure or laminate which allows the multilayer structure to be preferentially torn, or otherwise manipulated (for opening) along that path in a manner that was not possible without the scores (and without employing a cutting instrument).

The output power of the laser can conceivably be of any wattage. High wattages are preferred for example when it is desired that the laser emit a plurality of beams. Thus, laser power can be in the range of up to about 500 watts in order to permit simultaneous use of say, five 100 watt beams or ten 50 watt beams. Multiple beams can be produced by any of the known means such as beam splitting by partial reflectors. Generally, the beam power used is varied depending on the thickness of the multilayer structure or laminate being worked and the relative motion between the beam and the workplace. For example, it has been found that for multilayer thermoplastic laminates of up to about 0.0762 mm to 0.127 mm (3.0 to 5.0 mils), it is advantageous to use beams of about 2 to 100 watts, preferably about 2 to 50 watts.

Either pulsed or continuous laser beams can be utilized according to the method of this invention. Pulsed beams can be employed for forming dashed or discontinuous scores, but continuous beams are preferred when continuous easy open tear scores are desired. Continuous beams are also preferred because they can subject laminates to a greater total amount of energy.

The mode structure of the laser beam can be single or multiple but single mode beams are preferred because their energy is more concentrated and because they are focusable to smaller sport diameters.

The laser beams preferably are focused but can be unfocused. The diameters of the spot to which a laser beam is focused to effect a satisfactory score according to this invention can be of any suitable dimension, depending, inter alia, on the thickness of the laminate layers and the type of degradation and the characteristics of the score desired. Although spots of beam of short wavelengths can be focused to sizes less than 1 micron in diameter, the minimum spot size for a carbon dioxide laser having a wavelength of 10.6 microns, can range from about 0.0508 mm to 0.254 mm (2.0 to 10.0 mils) depending on beam mode structure and lens focal length. It has been found that for forming the preferential tear scores of this invention in relatively thin multilayer laminates having a total thickness of up to about 0.0762 mm to 0.127 mm (3.0 to 5.0 mils), a minimum spot diameter is preferred. For the carbon dioxide laser, preferred spot sizes are from about 0.0508 mm to 0.0762 mm (2.0 to 3.0 mils). For purposes of this invention, a multilayer polymeric laminate includes a laminate having at least one layer which is polymeric, and multilayer thermoplastic laminate includes one having at least one thermoplastic layer. Usually, at least one layer is polymeric. Both multilayer polymeric laminates and multilayer thermoplastic laminates are included within the terms laminate and multilayer structure.

Any suitable lens capable of focusing beams to the aforementioned small spot sized can be utilized with the lasers of this invention. Lenses having short focal lengths are preferred because they provide the desired small spot sizes. A variety of materials known to the art are available for use as such lenses depending on the wave-length to be transmitted there through. For example, germanium, gallium arsenide or sodium chloride lenses can be used with the carbon dioxide laser.

An example of a suitable laser which possesses the aforementioned characteristics and which has been successfully utilized according to this invention to form a preferential easy open tear feature in multilayer thermoplastic laminates of a thickness of up to about 0.0762 mm to 0.127 mm (3.0 to 5.0 mils) is a carbon dioxide flowing gas laser having a power range of up to 25 watt and emitting a continuous single-mode beam having a wavelength of 10.6 microns focused to a spot diameter of about 0.0508 mm (2.0 mils) by a 25.4 mm (1 inch) focal length germanium lens. The lens was fitted with a coaxial air nozzled to prevent debris from striking the

lens and to clear out evolving gases in the vicinity of the scores begin formed. Another example of a suitable laser is the aforementioned neodymium-yttrium aluminium garnet laser which could have a wavelength as short as 1.06 microns.

Vaporization is commonly believed to be the manner in which a laser beam effects a score line in a layer of material. When there is relative movement along a predetermined path between a laser beam of a particular wavelength and a layer of a material partly transparent to that wavelength, energy the width of the diameter of the beam and more concentrated at is center, is absorbed into the material. In thermoplastics for example, as the energy is absorbed it is transformed into heat which softens and melts the material along the beam path. Toward the center of the beam path where the intensity is greater, some of the thermoplastic molecules are vaporized and the resulting expanding gases form the score lines in the material. If the molecules that are vaporized are at the surface of the material, their gases leave cavities as they rise directly into the atmosphere. If the vaporized molecules are not on the surface, their gases form bubbles which rise through, blow out, or even, if the energy density is great enough, explode through surrounding and/or overlying melted material. As the expanding bubbles form and rise, they mechanically move molten material out of the way. Under proper conditions, e.g., when a beam of sufficient intensity is subjected to a material for a sufficient time, enough molecules are vaporized along a line such that resulting bubbles merge, coalesce, or otherwise cooperate to form a score line or groove. The material moved by the bubbles forms a slightly protruding bead along the surface of each of the groove's upper longitudinal edges. Although most of the bubbles which form the score line result from vaporization of thermoplastic material, some bubble sites apparently result from hot spots caused by highly absorbent impurities such as dirt or metals and from entrapped moisture or gases normally present for example in molecular lattice structures and grain boundaries of the thermoplastic. The size and distribution of bubbles occurring in a material depend on several factors including the intensity of the beam, the time it impinges an area of the material and the characteristics of the material itself.

Where vaporization of molecules occurs in a material, i.e., at its surface or within its thickness, depends on the coefficient of absorption as applied in the exponential absorption law and on the termal diffusivity and conductivity of the material. Vaporization will first occur mostly at or near the incident surface and will proceed downward increment into materials having a high coefficient, whereas it will occur fairly uniformly though the thickness of those having a low coefficient of absorption. It has been found difficult to groove and, leave sufficient residual material in thin layers of material having a low absorption coefficient because their fairly uniform manner of vaporization requires highly critical control of processing conditions such as material beam exposure time.

As for relative positioning of the layers selected to comprise the multilayer structures, e.g., laminates of this invention, the more absorbent or absorptive layer, i.e., the one having the highest coefficient of absorption, can be at any level in the structure. When the multilayer structure includes a more absorbent, i.e., absorptive, layer proximate to the source and a less absorbent underlying layer, the scores or cuts can be safely effected by vaporization of the proximate layer without substantial danger of affecting or cutting completely through the underlying layer of the structure. This is because any excess energy due to, for example, excess exposure time will substantially pass through the underlying less absorbent layer.

When the relatively more absorbent layer is in an interior position and is covered by one or more, less absorbent polymeric or composite materials and backed by a least absorbent layer, the scores can be formed in the multilayer structure by vaporization solely of the more absorbent inner layer or of it and other layers. The laser beam penetrates the overlying layers perhaps somewhat affecting them and vaporized the inner layer without materially affecting the backing layer. Bubbles forming therein could for example be entrapped between the outer layers to form cavitous scores, or could flow out through the softened molten or partially vaporized upper layer or layers.

When the more absorbent layer is least proximate to the source and overlying layers are less absorbent, the scores can be formed by a beam which penetrates and loses some energy to but may not substantially affect at least one of the overlying layers but which has sufficient energy left to vaporize the least proximate, absorbent layers. With this combination of layers, vaporized gases could escape for example through the undermost surface of the least proximate layer or through overlying layers. The escape of such gases can be used to cooperate with the scores to form easy opening tearing means such as tear strips and pull tabs. For example, the escape can aid in the delamination of layers or the overcoming of a seal along a certain path between layers and can thereby cooperate with one or more adjacent or parallel scores to provide the easy opening feature. Of course, the scores can without the use of escaping gases, cooperate with a package seal to aid in the releasing of one or more sealed layers from one or more adjacent layers in an easy opening manner.

In the aforementioned case in which a less absorbent layer overlies a more absorbent layer, there may be multilayer structures in which the less absorbent layer absorbs more energy than the highest coefficient layer. For example, in a structure which is a laminate, a less absorbent material such as polyethylene may be sufficiently thick to absorb a greater amount of energy than a more absorbent underlying layer of polyvinyl alcohol.

In such a laminate, vaporization of the polyvinyl alcohol forms scores, and, gases from such vaporization aid in forming scores in the less absorptive polyethylene layer and in the laminate.

The operating conditions and parameters for employing the methods of this invention can vary widely generally depending on such aforementioned factors as the type of laser used, the wavelength, frequency, power, continuity, mode structure and focusability of the beam, and the characteristics of the scores desired and the characteristics and intended used of the multilayer structure of laminate. When the above factors have been considered and the required scores specified for the given multilayer structure of laminate, the processing parameters can then be defined in terms of beam intensity in watts/mm^2(in^2) and exposure time in meters/min (ft/mm).

Beam intensity is determined by beam power and spot diameter. For example, a carbon dioxide laser beam of 25 watts power can have a beam intensity of about 5.43 kilowatts/mm^2 (3.5 megawatts/in^2) when focused to a spot diameter of about 0.0762 mm (3.0 mils). If spot diameter is held constant, intensity is directly determined by power. If, as usually is the situation, the intensity, i.e., both spot diameter and power, is held constant, exposure time determines the total amount of energy delivered to a given amount of material. Exposure time is determined by rate of relative movement between the laser beam and the multilayer structure or laminate.

Relative movement assures that exposure time is not excessive, i.e., that the laser beam does not linger on and cut completely through the multilayer or film structure being worked. It also allows scores to be formed along any predetermined path of any direction or configuration. Either the laser beam or the structure or both can be moved in relation to each other along the path. Preferably, the structure is passed under a stationary beam. For forming scores in continuous lengths of flexible multilayer thermoplastic package substrates comprising laminates, it has been found convenient to place one or more stationary lasers at the end of a laminating line or at the end of the sealing line so that its beams produce desired lines along the length of the "open package" multilayer laminate sheet or along the length of the laminate or multilayer sheet as it is being wound from a roll onto another wind up roll. The motion can be at any suitable rate for a particular selected combination of the forementioned factors. More particularly, the rate of speed is controlled and is correlated with beam intensity, with coefficients of absorption of the layer or layers of the structure, especially the most absorptive thereof, and with the type and depth of scores desired. Examples of ranges of processing speeds and of how to alter the same are set forth in U.S. Patents Nos. 3,909,582 and 3,790,744.

Referring now to the Figures, Figs. 1-3 show apparatus for scoring packaging substrates in accordance with the present invention. Packaging substrate 10′ is in roll form and is being conveyed by rollers 15 and 20 to laser beams 30 or 30′ and 30″ which accordingly score substrate 10′ to form scored substrate 10. A wind up roll for collecting scored substrate 10 is not shown. Lasers 25 (Fig. 1) provide three scores; Lasers 25′ (Fig. 2) provides two scores; and, Laser 25″ (Fig. 3) provides two scores by having its beam 30 pass through beam splitter 35 which can be a semi-transparent mirror to produce beams 30′ and 30″. Beam 30″ is directed to substrate 10′ by mirror 40. Beams 30′ and 30″ can be mirror split and the mirror beams therefrom directed to substrate 10′ by the use of additional beam splitters and mirrors appropriately positioned.

Fig. 4 shows package 100 of the invention, bearing phantom writing 110. From the view shown, face 105 is visible. A second face is below face 105; said second face is sealed to face 105 at edges 120, 120′ and 120″ which are sealed. Across the full width of package 100, including across two side sealed edges 120′, run laser scores 125 and 125′. Note that laser scores 125 and 125′ are near or adjacent to sealed edge 120 and are between sealed edges 120 and 120″. Area 126 lies between laser scores 125 and 125′ and is a tear strip. An end user tearing at area 126 will find that package 100 easily opens thereat. Phantom writing 110 can include instructions to tear at area 126 as well as directions with respect to any contents within package 100.

To produce package 100 from a substrate 10′ such as shown in Figs. 1-3, it is preferred that the substrate 10′ be made by forming face 105 and the second face (not shown), including applying thereto any printing or writing which is to appear thereon (such as phantom writing 110); that said faces be aligned and sealed at edges 120′ and 120″; and that the then resulting substrate 10′ be subjected to laser scoring as shown in Figs. 1-3 to produce scored substrate 10. Individual open packages are then cut from scored substrate 10, filled and sealed at edge 120.

Fig. 4A shows a package 200 which is similar to package 100 of Fig. 4, except that in addition to face 105 and the second face (not shown) there is a third structure, bottom 205 which is sealed to face 105 and the second face at edges 220 and 220. Bottom 205, when package 200 is empty, can fold and be positioned between face 105 and the second face so that package 200, when empty, lies substantially flat. Alternatively, bottom 205 can project outwardly from face 105 and the second face such that the package would have a rounded bottom. Bottom 205 allows package 200 to expand, e.g., when filled.

Fig. 4B shows open package 300 of the present invention formed from a tube. Open package 300 bears laser scores 125 and 125' and area 126 as well as sealed edge 320.

Turning to Figs. 5A-5F, Figs. 5A and 5B show package 400, which bears phantom writing 410, and has top face 405 and pan base 406. Top face 405 is peelably

sealed to pan base 406 at side seal edges 420"; Pan base 406 is also affixed to top face 405 at top seal 420. Seals 420' and 420" seal between pan base 406 and top face 405 bottom 505 which is akin to bottom 205 fig. 4A. Package 400 is provided with laser scores 125, 125', 125", and 125'". Area 126 is between laser scores 125 and 125' and, area 126' is between laser scores 125" and 125'". Surface 406' is the outside, bottom surface of pan base 406.

The use of package 400 is shown in Figs. 5C-5F. In Fig. 5C, area 126 has been torn at, thereby opening package 400 at opening 450. Note that score 125 remains with package 400, score 125' comes off with portion 460 and that area 126 is divided between package 400 and portion 460. Scoring packaging substrates in accordance with this invention provides packages which open substantially as illustrated herein.

Package 400 is then positioned with opening 450 facing up (Fig. 5D). Additional ingredients 500 can be added into package 400 (Fig. 5D) which can even be formed to stand on its own by bottom 505 opening (like bottom 205 is opened shown in Fig. 4A). The ingredients within package 400 can even be subjected to mixing, e.g., from mixer 600. (Fig. 5E).

Thereafter, the end user carefully sets package 400 onto the bottom surface 406' of base pan 406 (Fig. 5B), allowing the ingredients to settle into base pan 406. The end user then tears at area 126' to further remove top face 405; and, to fully remove it, peels away side seal edges 420'" to be left with base pan 406 containing the mixed ingredients. (Fig. 5F).

If base pan 406 is of metal, it can go directly into a conventional oven. If base pan 406 is of a non-metal, e.g., a thermoplastic material, or polymeric material (e.g., a multilayer structure or laminate), it can go directly into a microwave oven. With respect to pouch and pan or tray-like structures which are microwaveable and materials for making the same, reference is made U.S. Patent No. 4,355,721, incorporate herein by reference.

Fig. 7 shows a packaging substrate 600 for the fold and seal embodiment of the present invention. Packaging substrate 600 is shown in the folded and sealed condition, i.e., as package 600' in Fig. 6. Packaging substrate 600 has laser scores 125 and 125"; the area between these scores being tear strip 626. Areas where packaging substrate 600 is either folded or sealed are set off with borders of dotted line. When packaging substrate 600 is folded and sealed into packaging substrate 600, area 635 is folded underneath area 630 and the package is sealed together thereat; the package is also folded and sealed together at side areas 660, to make respectively seals 635' and 660' (Fig. 6). Further, packaging substrate 600' is resting upon area 650 with area 630 facing the viewer. Area 680, in Fig. 6 is within the plane of the paper. And, area 640 is at the top of package 600'. Packaging substrate 600 can be formed as a continuous sheet and scored as shown in Figs. 1-3. When so formed, individual substrates, as shown in Fig. 7, are cut from the continuous sheet at lines 636 and 637. Note that line 636 is substantially straight, except for the cut out 626' which forms the tab of the tearstrip of the preceeding sheet. And, line 637 is substantially straight, except, for the tab 626' which protrudes therefrom. Note that tab 626' can also protrude from package 600'. The distance between lines 636 and 637 can be considered the width of packaging substrate 600.

Areas such as 630, and/or 680 can bear printing, e.g., instructing the end user as to the contents of package 600' or as to how to use tear strip 626 (e.g., "pull at tab [626']"). It if preferred that packaging substrate 600 be fully formed, including any printing thereon, prior to applying laser scores 125 and 125'; or, in other words, it is preferred that laser scoring occur immediately prior to folding and sealing packaging substrate 600 into package 600'.

Claims

1. A package (100;200;400) having a front face (105;405) and a rear face and comprising a film structure (10') comprised of a plurality of superimposed layers sealed to form said package, said structure (10') having its outer surface (105;405) scored across an entire width of said package with at least two parallel linear laser scores (125,125';125",125'") defining between them a tear strip (126;126'), wherein said scores can extend in depth through the first and or second layers but not through the third layer of the film structure, characterized in that said scores (125,125';125",125'") extend across an entire width of said film structure (10'), said scores are spaced from each other by 1.587 to 4.76 mm (1/16" to 3/16") and between them define a tear strip area 126,126', and scores of said front and rear faces are aligned and provide an easy-open tear control feature, such that an end user tearing at the tear strip area (126,126') to tear away a portion of the package and open the package obtains a controlled tear opening through the tear strip area across the entire width of the package, such that the tear strip area is divided between the package and the torn away portion of the package.

2. A package (100;200;400) according to claim 1 comprising two film structures (10'), said structures being sealed together to form said package, one said structure (10') having a face forming the front face of said package and the other of said structures having a face forming the rear face of said package, said package being further characterized in that said structures have and are sealed along their side sealed edges (120';420') and scores (125,125';125",125'") extend across said side sealed edges (120',420'), said scores are formed in

said front and rear faces of said package and scores thereof are aligned and provide the easy open tear control feature.

3. A package (100;200;400) according to claim 1 or 2, wherein the film structure (10') comprises a plurality of superimposed layers which comprise from outer layer to inner layer: a first layer comprising a polyester, a second layer comprising polyethylene, a third layer comprising polyester, a fourth layer of polyethylene, a fifth layer comprising a sealant film and a sixth layer comprising linear low density polyethylene.

4. A package (100;200;300;400) according to claim 1 or 2, wherein the film structure (10') comprises a plurality of super-imposed layers which comprise from outer to inner layer; a first layer comprising a polyester, a second layer comprising polyethylene, a third layer comprising ethylene acrylic acid, a fourth layer comprising metal foil, and a fifth layer comprising ethylene methyl acrylate.

5. A package according to claim 1 or 2, wherein the film structure (10') comprises a plurality of superimposed layers which comprise from outer to inner layer: a first layer comprising a polyester, a second layer comprising polyethylene, a third layer comprised of high density polyethylene and a fourth layer comprised of linear low density polyethylene.

6. A package according to any of claims 1 to 5, wherein upon opening the package by tearing at the aligned tear strip area, one score remains with the package, and another score comes off with the torn away portion of the package.

7. A package according to any of claims 1 to 6, wherein upon opening the package by tearing at the aligned tear strip area, score on said front and rear faces of the package remain with the package, and a score remains with the torn away portion of the package.

8. A package (100;200;400) according to any of claims 1 to 7 wherein said package is a pouch having a front face (105;405) and a rear face (406), each face having an inner surface and an outer surface (105;405), said two parallel linear scores (125,125';125',125'") being on said outer surface, and adjacent to at least one seal (120;420,420').

9. A package being a pouch (400) according to claim 8, wherein the laser scores (125,125') are adjacent to a first seal (420), and opposite that seal is a second seal (420) and a third seal (420'), and an additional structure (460), wherein the second seal (420) joins the inner surface of said front face (405) to said additional structure and said third seal (420') joins said rear face (405') to said additional structure (460) so that said pouch has an expandable side or bottom (505).

10. A package being a pouch (400) according to claim 9, additionally comprising at least two parallel linear laser scores (125",125'") across the full width of said pouch (400), adjacent to said second and third seals (420 and 420').

11. A package being a pouch (400) according to claim 10, wherein said rear face (406') comprises a pan (406).

12. A package being a pouch (100;200;400) according to any of claims 8 to 11 wherein the scores are on each of the front and rear faces.

13. A package according to any of the preceding claims, wherein the laser scores are continuous.

14. A package according to claim 3, wherein the laser scores are continuous and cut through the first and second layers of the film structure, but not through the third layer comprising polyester.

15. A package according to any of the preceding claims, wherein the film structure is 0.0127 to 0.254 mm (0.5 to 10 mils) thick.

16. A package according to claim 3, wherein the second and fourth layers comprise low density polyethylene and the fifth and sixth layers comprise coextrusion such that the fifth layer comprises a plurality of layers each comprised of high density polyethylene.

17. A package according to claim 16, wherein there is an ink layer disposed between the first and second layers, and the fifth layer comprises two layers of high density polyethylene, such that the film structure comprises, from outer layer to inner layer: a first layer comprising polyester; an ink layer; a second layer comprising low density polyethylene; a third layer comprising polyester; a fourth layer comprising low density polyethylene; and, a sixth layer comprising linear low density polyethylene.

18. A package according to claim 4, wherein the foil is of aluminum.

19. A package according to claim 18 wherein disposed between the first and second layers is an ink layer; and disposed between the fourth and the fifth layers is a layer comprising a primer.

20. Use of the package (400) of claim 10 to contain a

food mix, then to add ingredients through the opening (450) obtained by ripping the tear strip (126) at the first set of two scores (125,125').

21. Use of the package (400) according to claim 20, the added ingredients being subjected to mixing through said opening (450).

22. Use according to any of claims 20 or 21, said rear face (406") comprising a pan (406) and said front face (405) being joined also to the additional structure (460) by side seals (420'") then to allow said ingredients to settle into said pan (406) and to remove said pan (406) from the package (400) after ripping the tear strip (126') of the second set of scores (125',125") and peeling away edges of said side seals (420'").

Patentansprüche

1. Verpackung (100; 200; 400) mit einer Vorderseite (105; 405) und einer Rückseite und mit einer Filmstruktur (10'), die aus einer Vielzahl von überlagerten Lagen besteht, die zusammengeschweißt sind, um die besagte Verpackung zu bilden, wobei die äußere Oberfläche (105; 405) der besagten Struktur (10') über eine ganze Breitseite der besagten Verpackung mit mindestens zwei parallelen, geraden Laserkerben (125, 125'; 125", 125'") eingekerbt ist, die zusammen einen Aufreißstreifen (126; 126') begrenzen, wobei die besagten Kerben in der Tiefe durch die erste und/ oder zweite Lage hindurchgehen können, aber nicht durch die dritte Lage der Filmstruktur, dadurch gekennzeichnet, daß die besagten Kerben (125, 125'; 125", 125'") sich über eine ganze Breitseite der besagten Filmstruktur (10') ausdehnen, wobei die besagten Kerben 1,587 bis 4,76 mm (1/16" bis 3/16") von einander entfernt sind und zusammen einen Aufreißstreifenbereich 126, 126' begrenzen, und die Kerben der besagten Vorder- und Rückseiten sind axial ausgerichtet und ergeben das Merkmal einer leicht zu öffnenden Aufreißkontrolle, so daß ein Endbenutzer, der an dem Aufreißstreifenbereich (126, 126') zieht, um einen Teil der Verpackung wegzuziehen und die Verpackung zu öffnen, ein kontrolliertes Aufreißen durch den Aufreißstreifenbereich über die ganze Breite der Verpackung erhält, so daß der Aufreißstreifenbereich sich zwischen der Verpackung und dem abgerissenen Teil der Verpackung trennt.

2. Verpackung (100; 200; 400) nach Anspruch 1, die zwei Filmstrukturen (10') umfaßt, wobei die besagten Strukturen zusammengeschweißt sind, um die besagte Verpackung zu bilden, wobei eine besagte Struktur (10') eine Seite hat, die die Vorderseite der besagten Verpackung bildet und die andere der besagten Strukturen eine Seite hat, die die Rückseite der besagten Verpackung bildet, wobei die besagte Verpackung außerdem dadurch gekennzeichnet ist, daß die besagten Strukturen zusammengeschweißt sind und an den Seiten zusammengeschweißte Kanten (120'; 420') haben und die Kerben (125, 125'; 125", 125'") sich über die besagten zusammengeschweißten Kanten (120', 420') ausdehnen, wobei die besagten Kerben auf den besagten Vorder- und Rückseiten der besagten Verpackung ausgebildet sind, und ihre Kerben sind axial ausgerichtet und ergeben das Merkmal der leicht zu öffnenden Aufreißkontrolle.

3. Verpackung (100; 200; 400) nach Anspruch 1 oder 2, bei der die Filmstruktur (10') eine Vielzahl überlagerter Lagen umfaßt, die von der Außen- bis zur Innenlage folgendes umfassen: eine erste Polyester enthaltende Lage, eine zweite Polyethylen enthaltende Lage, eine dritte Polyester enthaltende Lage, eine vierte Polyethylen enthaltende Lage, eine fünfte einen Film aus Dichtungsmasse enthaltende Lage und eine sechste lineares Weichpolyethylen enthaltende Lage.

4. Verpackung (100; 200; 300; 400) nach Anspruch 1 oder 2, bei der die Filmstruktur (10') eine Vielzahl überlagerter Lagen umfaßt, die von der Außen- bis zur Innenlage folgendes umfassen: eine erste Polyethylen enthaltende Lage, eine zweite Polyethylen enthaltende Lage, eine dritte Akrylsäure-Ethylen enthaltende Lage, eine vierte Metallfolie enthaltende Lage und eine fünfte Akrylsäuremethylester-Ethylen enthaltende Lage.

5. Verpackung nach Anspruch 1 oder 2, bei der die Filmstruktur (10') eine Vielzahl überlagerter Lagen umfaßt, die von der Außen- bis zur Innenlage folgendes umfassen: eine erste Polyester enthaltende Lage, eine zweite Polyethylen enthaltende Lage, eine dritte Hartpolyethylen enthaltende Lage und eine vierte lineares Weichpolyethylen enthaltende Lage.

6. Verpackung nach einem der Ansprüche 1 bis 5, wobei nach Öffnen der Verpackung durch Aufreißen am axial ausgerichteten Aufreißstreifenbereich eine Kerbe an der Verpackung bleibt und eine andere Kerbe sich mit dem abgerissenen Teil der Verpackung löst.

7. Verpackung nach einem der Ansprüche 1 bis 6, wobei nach Öffnen der Verpackung durch Aufreißen am axial ausgerichteten Aufreißstreifenbereich eine Kerbe auf den besagten Vorder- und Rückseiten der Verpackung an der Verpackung bleibt und eine Kerbe an dem abgerissenen Teil der Verpakkung bleibt.

8. Verpackung (100; 200; 400) nach einem der Ansprüche 1 bis 7, wobei die besagte Verpackung ein Beutel ist, der eine Vorderseite (105; 405) und eine Rückseite (406) hat, wobei jede Seite eine Innenseite und eine Außenseite (105; 405) hat, und die besagten beiden parallelen geraden Kerben (125, 125'; 125", 125"') sich auf der besagten Außenseite befinden und an mindestens einer Schweißkante (120; 420, 420') anliegen.

9. Verpackung in Beutelform (400) nach Anspruch 8, wobei die Laserkerben (125, 125') an einer ersten Schweißkante (420) anliegen, und gegenüber der Schweißkante befindet sich eine zweite Schweißkante (420) und eine dritte Schweißkante (420') und eine zusätzliche Struktur (460), wobei die zweite Schweißkante (420) die Innenseite der besagten Vorderseite (405) mit der zusätzlichen Struktur verbindet, und die besagte dritte Schweißkante (420') die besagte Rückseite (405') mit der besagten zusätzlichen Struktur (460) verbindet, so daß der besagte Beutel eine dehnbare Seite und Boden (505) hat.

10. Verpackung in Beutelform (400) nach Anspruch 9, die zusätzlich mindestens zwei parallele gerade Laserkerben (125"; 125"') über die ganze Breite des besagten Beutels (400) umfaßt, und zwar an den besagten zweiten und dritten Schweißkanten (420 und 420') anliegend.

11. Verpackung in Beutelform (400) nach Anspruch 10, wobei die besagte Rückseite (406') eine Schale (406) umfaßt.

12. Verpackung in Beutelform (100; 200; 400) nach einem der Ansprüche 8 bis 11, wobei die Kerben sich jeweils auf den Vorder- und Rückseiten befinden.

13. Verpackung nach einem der vorhergehenden Ansprüche, wobei die Laserkerben durchgehend sind.

14. Verpackung nach Anspruch 3, wobei die Laserkerben durchgehend sind und durch die erste und zweite Lage der Filmstruktur schneiden, aber nicht durch die dritte Polyester enthaltende Lage.

15. Verpackung nach einem der vorhergehenden Ansprüche, wobei die Filmstruktur 0,0127 bis 0,254 mm (0,5 bis 10 mils) dick ist.

16. Verpackung nach Anspruch 3, wobei die zweite und vierte Lage Weichpolyethylen enthalten und die fünfte und sechste Lage eine Koextrusion enthalten, so daß die fünfte Lage eine Vielzahl von Lagen umfaßt, die jeweils Hartpolyethylen enthalten.

17. Verpackung nach Anspruch 16, wobei eine Tintenlage zwischen den ersten und zweiten Lagen angeordnet ist, und die fünfte Lage umfaßt zwei Lagen aus Hartpolyethylen, so daß die Filmstruktur von der Außen- bis zur Innenlage folgendes umfaßt: eine erste Polyester enthaltende Lage; eine Tintenlage; eine zweite Weichpolyethylen enthaltende Lage; eine dritte Polyester enthaltende Lage; eine vierte Weichpolyethylen enthaltende Lage; und eine sechste lineares Weichpolyethylen enthaltende Lage.

18. Verpackung nach Anspruch 4, wobei die Folie aus Aluminium ist.

19. Verpackung nach Anspruch 18, wobei zwischen der ersten und zweiten Lage eine Tintenlage angeordnet ist; und zwischen der vierten und fünften Lage ist eine Lage mit einer Grundierung angeordnet.

20. Verwendung der Verpackung (400) nach Anspruch 10, um eine Lebensmittelmischung zu beinhalten, dann Zutaten hinzuzufügen durch die Öffnung (450), die durch Abreißen des Aufreißstreifens (126) an der ersten Gruppe der beiden Kerben (125, 125') entsteht.

21. Verwendung der Verpackung (400) nach Anspruch 20, wobei die hinzugefügten Zutaten durch die besagte Öffnung (450) hindurch vermischt werden.

22. Verwendung nach einem der Ansprüche 20 oder 21, wobei die besagte Rückseite (406") eine Schale (406) umfaßt, und die besagte Vorderseite (405) auch mit der zusätzlichen Struktur (460) durch seitliche Schweißkanten (420"") verbunden ist, man dann die besagten Zutaten in die besagte Schale (406) absetzen läßt und die besagte Schale (406) aus der Verpackung (400) nimmt, nach Abreißen des Aufreißstreifens (126') von der zweiten Gruppe der Kerben (125', 125") und nach Abziehen der Kanten der besagten seitlichen Schweißkanten (420"").

Revendications

1. Emballage (100;200;400) possédant une face avant (105;405) et une face arrière et comprend une structure pelliculaire (10') composée d'une pluralité de couches superposées et soudée de manière à former ledit emballage, ladite structure (10') ayant sa surface extérieure (105;405) scarifiée sur toute une largeur dudit emballage par au moins deux scarifications linéaires parallèles réalisées au laser (125,125';125",125"') définissant entre elles une bande de déchirement (126;126'), dans lequel lesdites scarifications peuvent s'étendre en profon-

deur à travers la première et/ou la deuxième couches, mais non à travers la troisième couche de la structure pelliculaire, caractérisé en ce que lesdites scarifications (125,125';125",125"') s'étendent sur toute une largeur de ladite structure pelliculaire (10'), lesdites scarifications sont espacées entre elles de 1,587 à 4,76 mm (1/16 à 3/16 de pouce) et définissent entre elles une zone de déchirement de type bande (126,126') et les scarifications desdites faces avant et arrière sont alignées et confèrent à l'emballage une caractéristique d'ouverture facile et de contrôle du déchirement, de telle sorte que l'utilisateur final, déchirant l'emballage au niveau de la zone de déchirement de type bande (126,126') pour arracher une partie de l'emballage et ouvrir celui-ci, obtient une ouverture à déchirement contrôlé à travers la zone de déchirement de type bande, sur toute la largeur de l'emballage, si bien que la zone de déchirement de type bande se trouve divisée entre l'emballage et la partie arrachée de celui-ci.

2. Emballage (100;200;400) selon la revendication 1, comprenant deux structures pelliculaires (10'), lesdites structures étant assemblées par soudage de manière à former ledit emballage, l'une desdites structures (10') possédant une face qui forme la face avant dudit emballage et l'autre desdites structures possédant une face qui forme la face arrière dudit emballage, ledit emballage étant en outre caractérisé en ce que lesdites structures possèdent des bords latéraux (120';420 ') et sont soudées le long de ces bords latéraux et les scarifications (125,125';125",125"') traversent lesdits bords latéraux soudés (120;420 '), lesdites scarifications sont pratiquées dans lesdites faces avant et arrière dudit emballage et les scarifications de ces faces sont alignées et confèrent à l'emballage la caractéristique d'ouverture facile et de contrôle du déchirement.

3. Emballage (100;200;400) selon la revendication 1 ou la revendication 2, dans lequel la structure pelliculaire (10') comprend une pluralité de couches superposées qui sont composées de la couche extérieure à la couche intérieure : d'une première couche constituée d'un polyester d'une deuxième couche constituée de polyéthylène, d'une troisième couche constituée de polyester, d'une quatrième couche de polyéthylène, d'une cinquième couche constituée d'une pellicule de matériau d'étanchement et d'une sixième couche constituée de polyéthylène linéaire à basse densité.

4. Emballage (100;200;300;400) selon la revendication 1 ou la revendication 2, dans lequel la structure pelliculaire (10') comprend une pluralité de couches superposées qui sont composées de la couche extérieure à la couche intérieure : d'une première couche constituée d'un polyester, d'une deuxième couche constituée de polyéthylène, d'une troisième couche constituée d'éthylène-acide acrylique, d'une quatrième couche constituée d'une feuille mince de métal et d'une cinquième couche constituée d'éthylène-acrylate de méthyle.

5. Emballage selon la revendication 1 ou la revendication 2, dans lequel la structure pelliculaire (10') comprend une pluralité de couches superposées qui sont composées, de la couche extérieure à la couche intérieure : d'une première couche constituée d'un polyester, d'une deuxième couche constituée de polyéthylène, d'une troisième couche constituée de polyéthylène à haute densité et d'une quatrième couche constituée de polyéthylène linéaire à basse densité.

6. Emballage selon l'une quelconque des revendications 1 à 5, dans lequel lorsque l'on ouvre l'emballage en le déchirant au niveau de la zone de déchirement alignée de type bande, l'une des scarifications reste sur l'emballage tandis qu'une autre s'en va avec la partie arrachée de celui-ci.

7. Emballage selon l'une quelconque des revendications 1 à 6, dans lequel lorsque l'on ouvre l'emballage en le déchirant au niveau de la zone de déchirement alignée de type bande, une scarification desdites faces avant et arrière de l'emballage reste sur celui-ci, tandis qu'une autre scarification reste sur la partie arrachée de l'emballage.

8. Emballage (100;200;400) selon l'une quelconque des revendications 1 à 7, dans lequel ledit emballage est un sachet qui possède une face avant (105;405) et une face arrière (406), chaque face possédant à son tour une surface intérieure et une surface extérieure (105;405), les deux dites scarifications linéaires parallèles (125,125';125",125"') se trouvant sur ladite surface extérieure et étant contiguës à au moins une soudure (120; 420; 420').

9. Emballage étant un sachet (400) selon la revendication 8, dans lequel les scarifications réalisées au laser (125,125') sont contiguës à une première soudure (420) et dans lequel on trouve, à l'opposé de cette soudure une deuxième soudure (420') et une troisième soudure (420"), ainsi qu'une structure supplémentaire (460), la deuxième soudure (420') raccordant la surface intérieure de ladite face avant (405) à ladite structure supplémentaire et ladite troisième soudure (420") raccordant ladite face arrière (405') à ladite structure supplémentaire (460), de telle sorte que le sachet possède un côté - ou un fond - extensible (505).

10. Emballage étant un sachet (400) selon la revendication 9, comportant en outre au moins deux scarifications linéaires parallèles réalisées au laser (125",125'") sur toute la largeur dudit sachet (400), contiguës auxdites deuxième et troisième soudures (420' et 420").

11. Emballage étant un sachet (400) selon la revendication 10, dans lequel ladite face arrière (406') est constituée par un plat (406).

12. Emballage étant un sachet (100;200;400) selon l'une quelconque des revendications 8 à 11, dans lequel les scarifications se trouvent sur chacune des faces avant et arrière.

13. Emballage selon l'une quelconque des revendications précédentes, dans lequel les scarifications réalisées au laser sont continues.

14. Emballage selon la revendication 3, dans lequel les scarifications réalisées au laser sont continues et sont pratiquées dans la première et la deuxième couches de la structure pelliculaire mais non dans la troisième couche constituée de polyester.

15. Emballage selon l'une quelconque des revendications précédentes, dans lequel la structure pelliculaire possède une épaisseur comprise entre 0,0127 et 0,254 mm (0,5 et 10 millièmes de pouce).

16. Emballage selon la revendication 3, dans lequel les deuxième et quatrième couches comprennent du polyéthylène à basse densité, tandis que les cinquième et sixième couches sont obtenues par coextrusion, de telle sorte que la cinquième couche est composée d'une pluralité de couches constituées chacune de polyéthylène à haute densité.

17. Emballage selon la revendication 16, dans lequel il existe une couche d'encre disposée entre la première et la deuxième couches et dans lequel la cinquième couche est constituée de deux couches de polyéthylène à haute densité, de telle sorte que la structure pelliculaire est composée, de la couche extérieure à la couche intérieure : d'une première couche constituée de polyester d'une couche d'encre d'une deuxième couche constituée de polyéthylène à basse densité, d'une troisième couche constituée de polyester, d'une quatrième couche constituée de polyéthylène à basse densité, d'une cinquième couche constituée de deux couches de polyéthylène à haute densité et d'une sixième couche constituée de polyéthylène linéaire à basse densité.

18. Emballage selon la revendication 4, dans lequel la feuille mince est en aluminium.

19. Emballage selon la revendication 18, dans lequel on trouve disposées, entre la première et la deuxième couches, une couche d'encre et entre la quatrième et la cinquième couches, une couche constituée d'un matériau d'accrochage.

20. Utilisation de l'emballage (400) de la revendication 10 pour contenir une préparation alimentaire, puis pour ajouter des ingrédients par l'ouverture (450) que l'on obtient en déchirant la bande de déchirement (126) au niveau du premier ensemble de deux scarifications (125,125').

21. Utilisation de l'emballage (400) selon la revendication 20, les ingrédients ajoutés étant soumis à un mixage réalisé par ladite ouverture (450).

22. Utilisation selon la revendication 20 ou la revendication 21, ladite face arrière (406") comprenant un plat (406) et ladite face avant (405) étant raccordée également à la structure supplémentaire (460) par des soudures latérales (420'") pour permettre ensuite auxdits ingrédients de se déposer dans ledit plat (406) et pour dégager ledit plat (406) de l'emballage (400), après avoir déchiré la bande de déchirement (126') du deuxième ensemble de scarifications (125 ,125) et enlevé par pelage les bords desdites soudures latérales (420'").

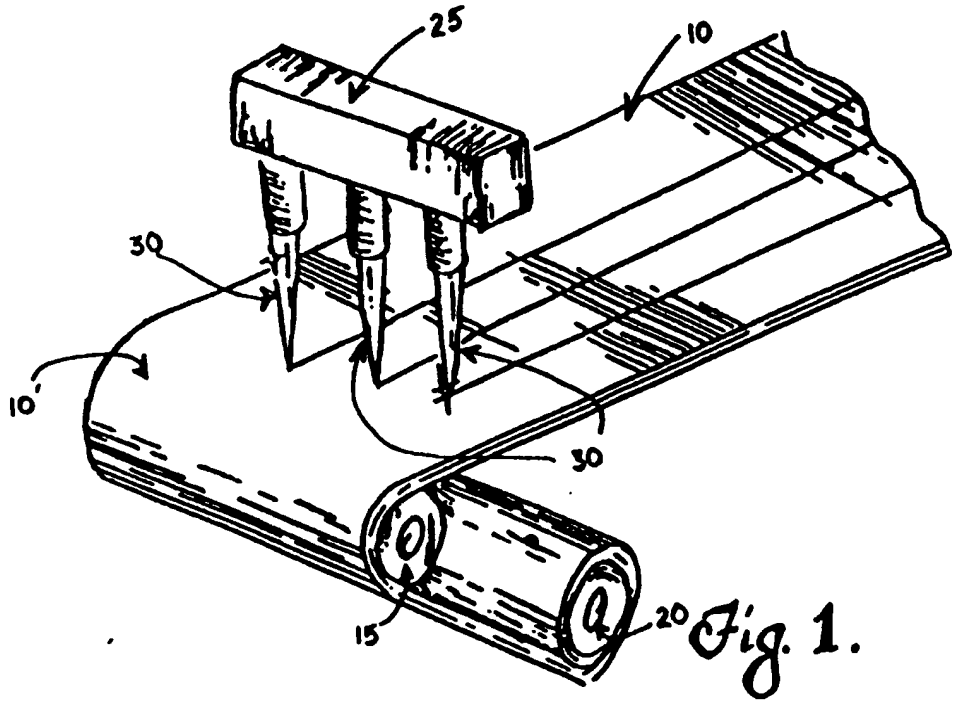

Fig. 1.

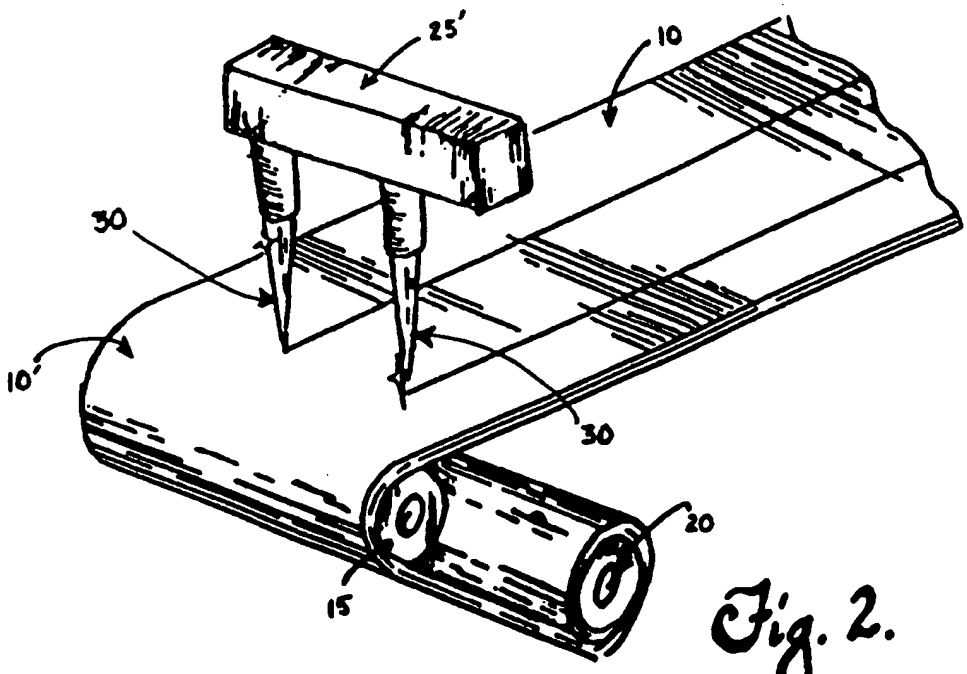

Fig. 2.

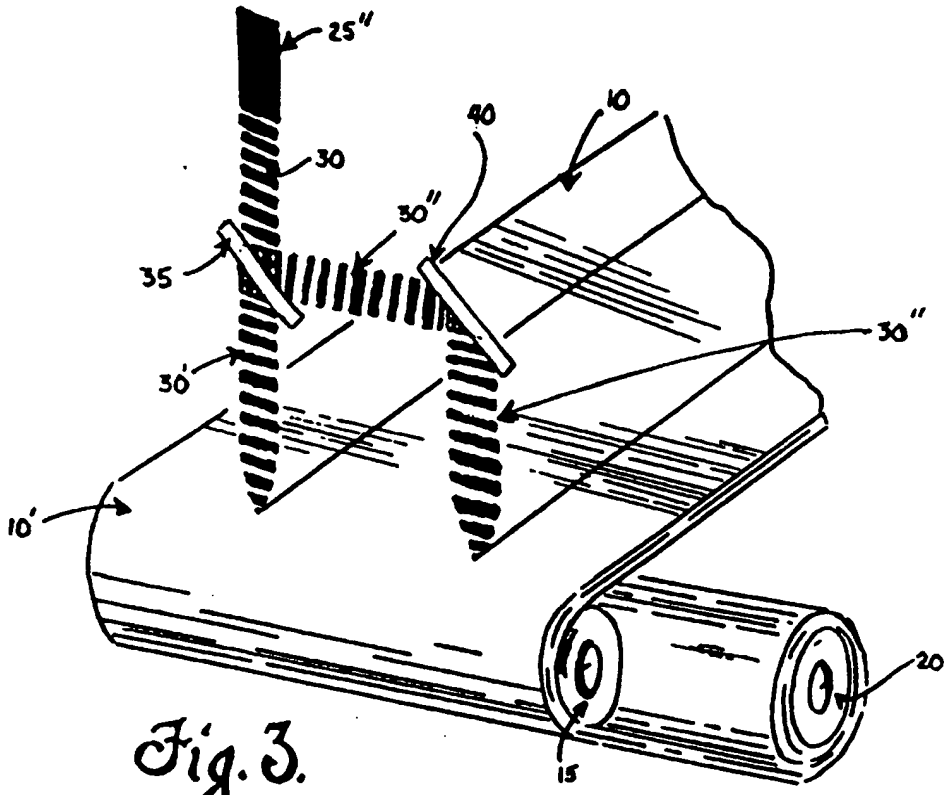

Fig. 3.

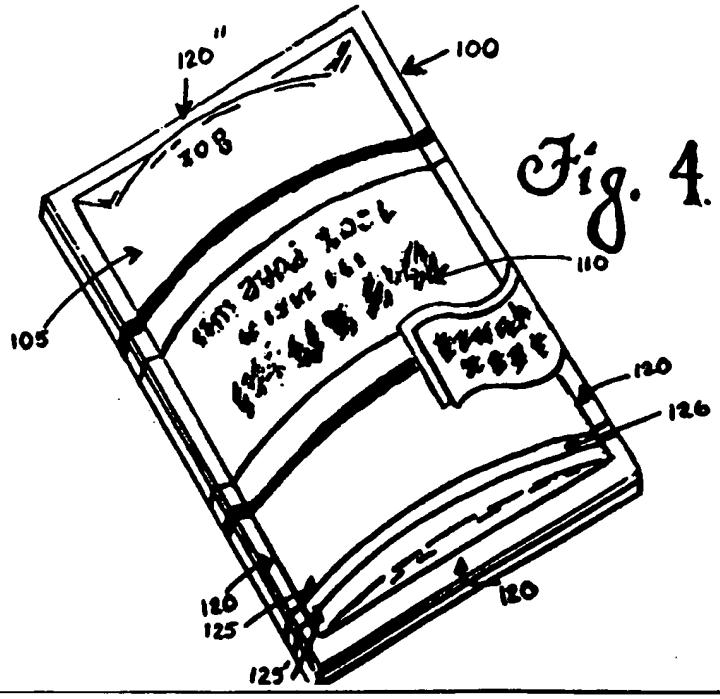

Fig. 4.

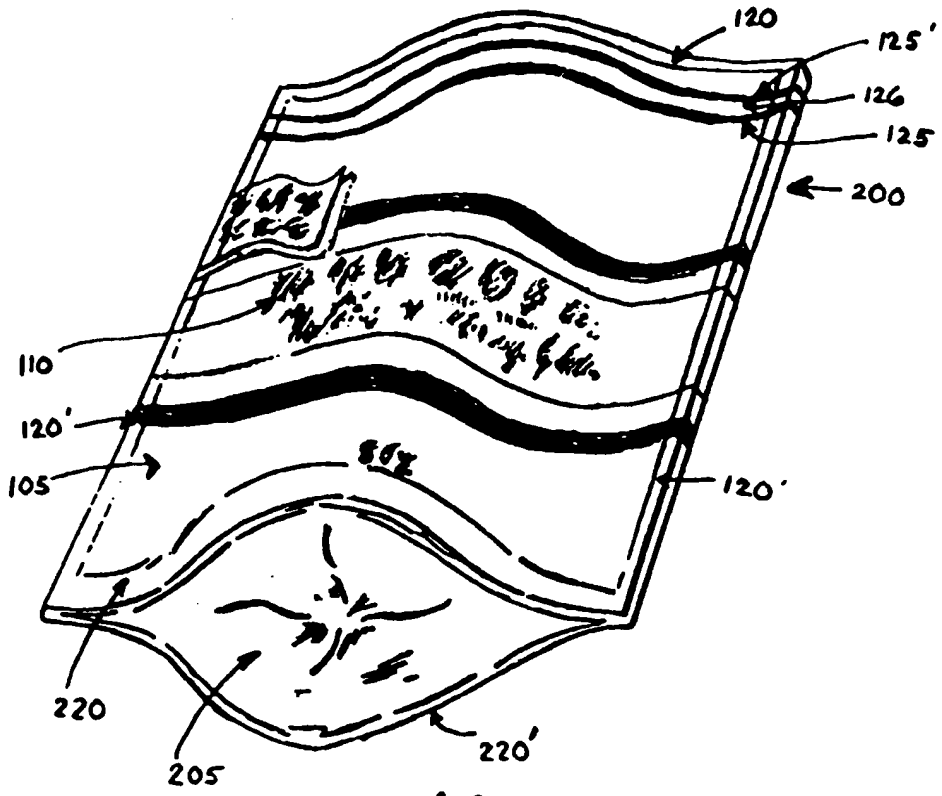

Fig. 4A.

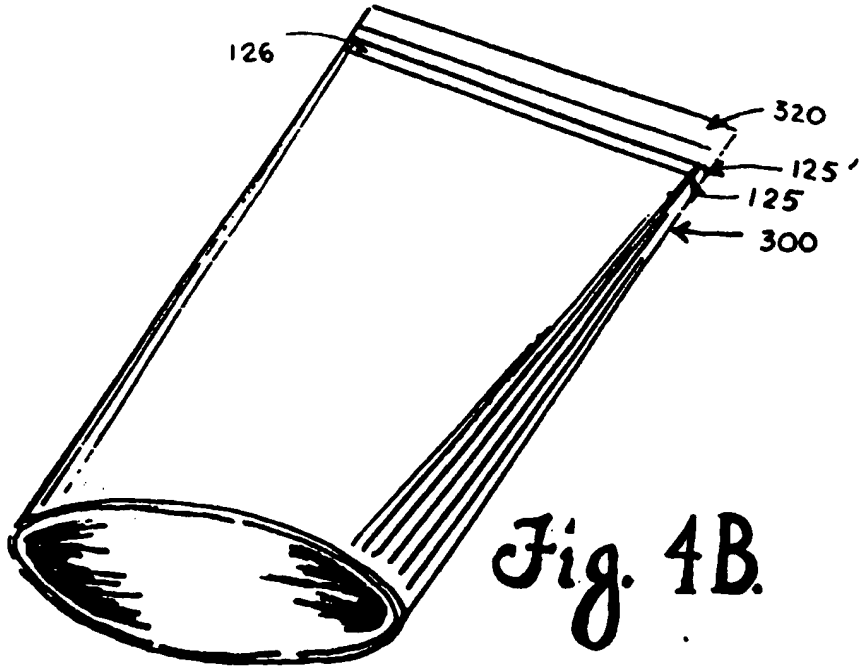

Fig. 4B.

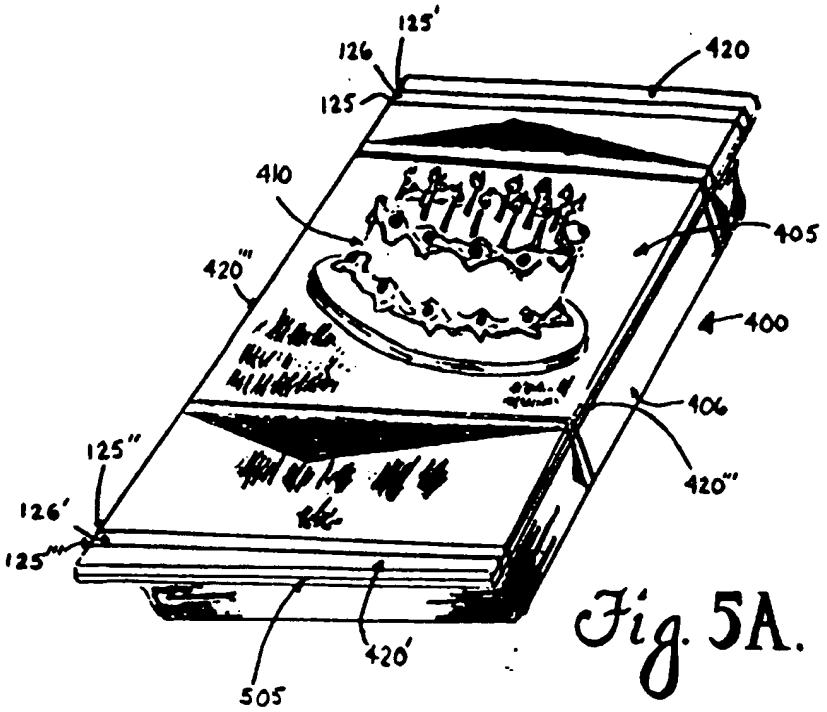

Fig. 5A.

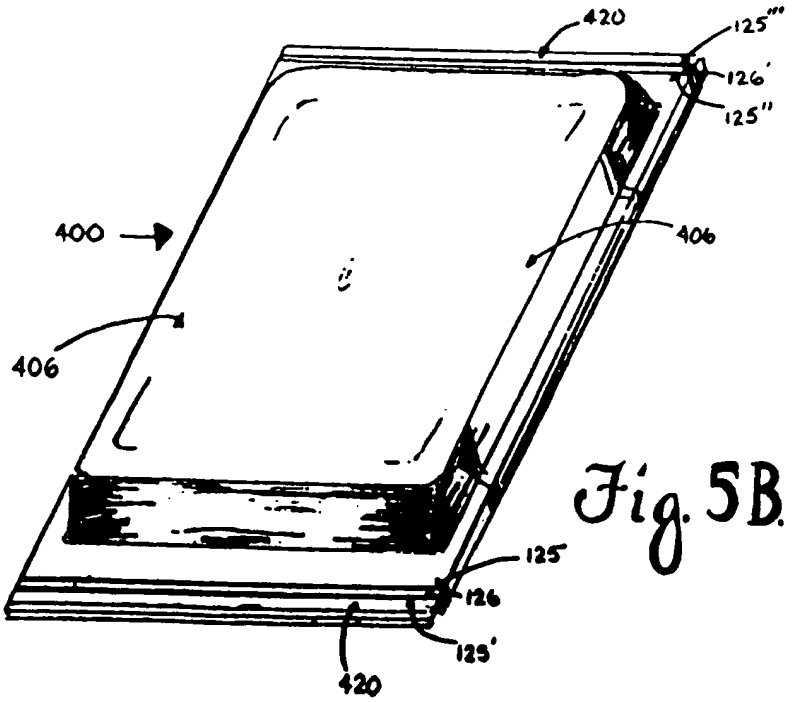

Fig. 5B.

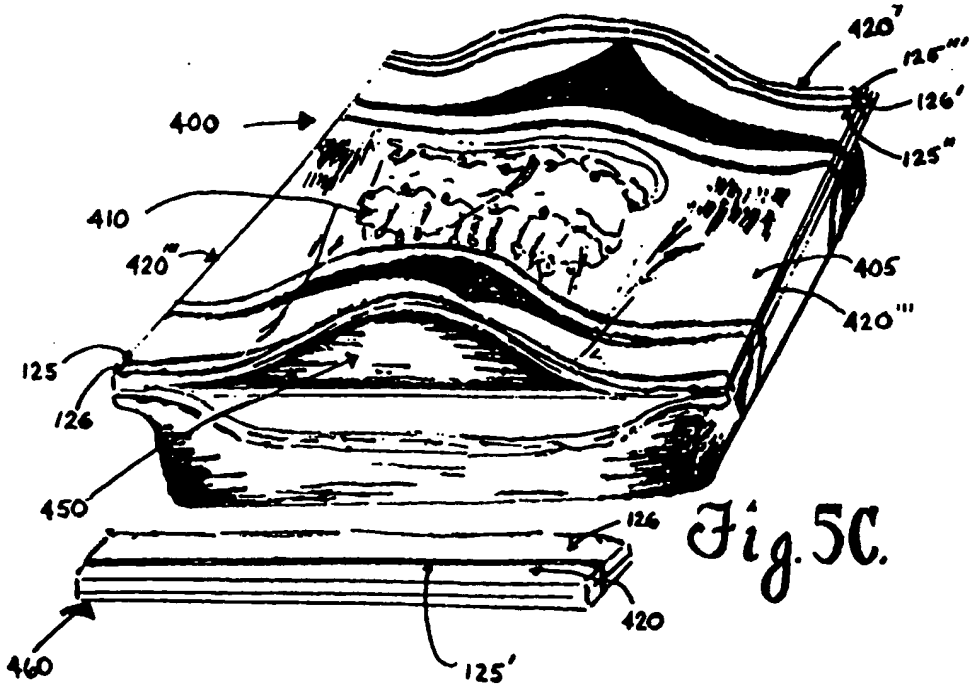

Fig. 5C.

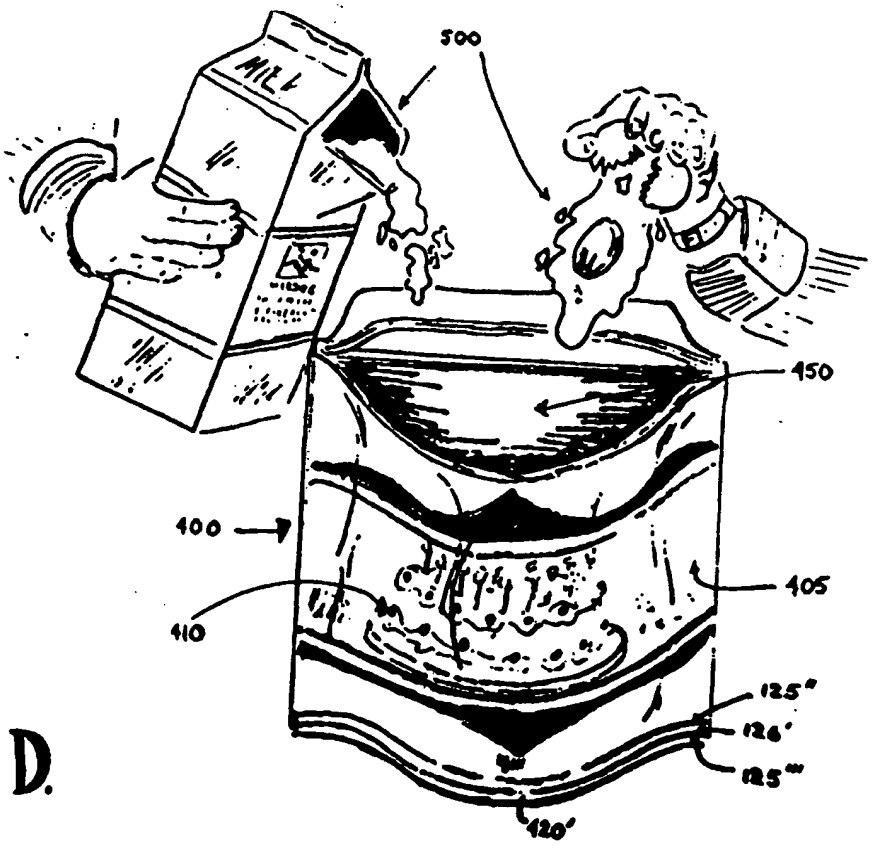

Fig. 5D.

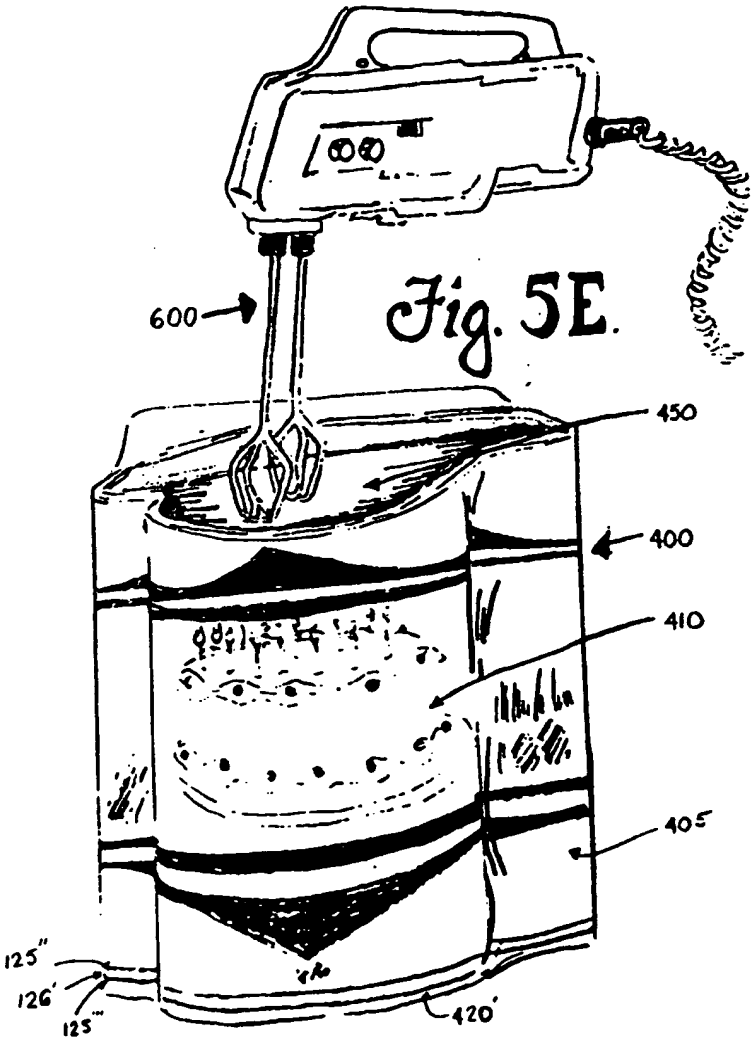

Fig. 5E.

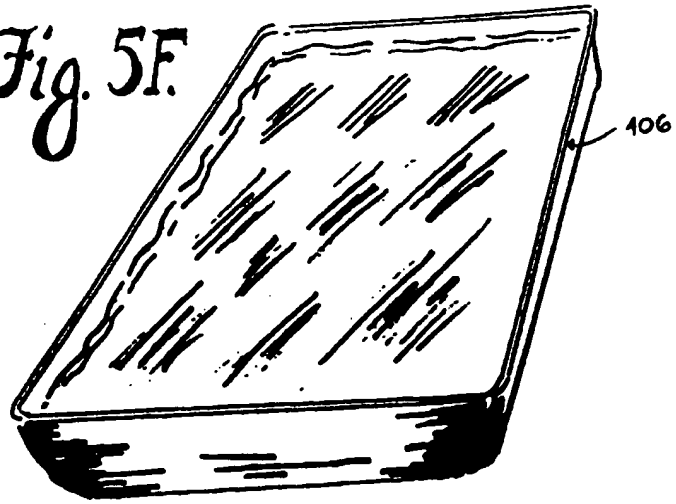

Fig. 5F.

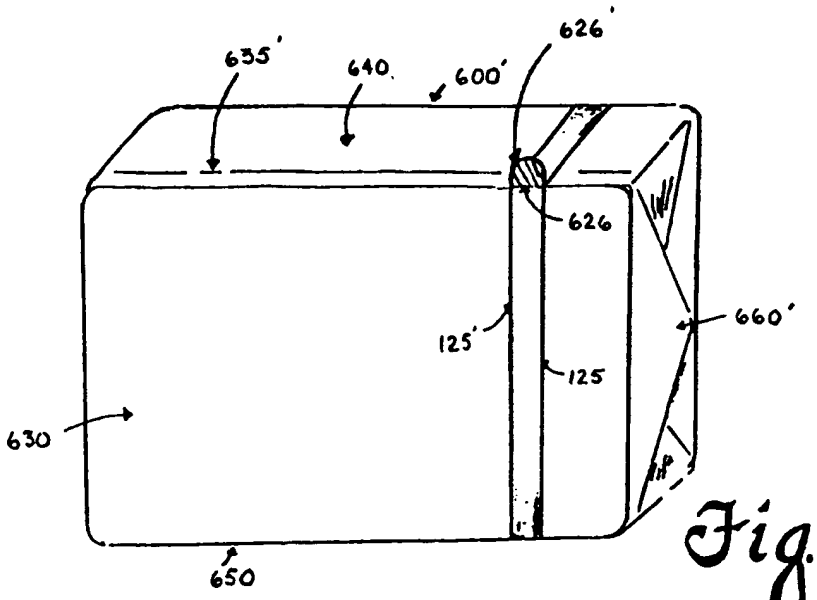

Fig. 6.

Fig. 7.